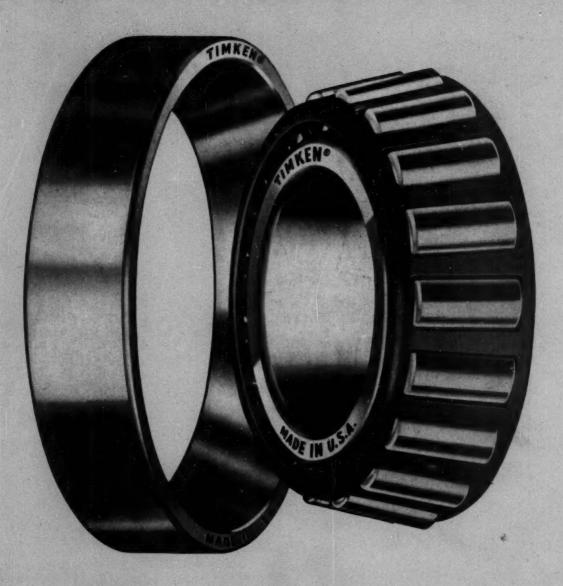
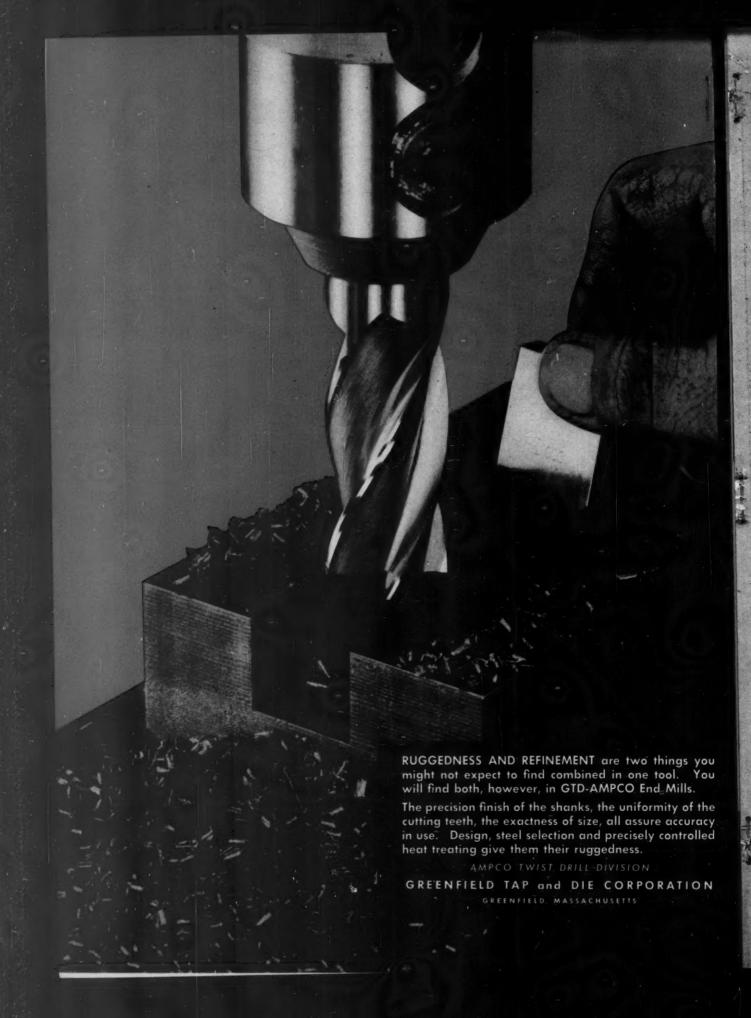
NOVEMBER, 1952 - FIFTY-NINTH YEAR

MACHINERY





This symbol on a product means its bearings are the best



Editor CHARLES O. HERB

Associate Editors
FREEMAN C. DUSTON
CHARLES H. WICK
EDGAR ALTHOLZ

Book Editor HOLBROOK L. HORTON

Published Monthly By THE INDUSTRIAL PRESS 148 Lafayotto St., Now York 13, N. Y.

ROBERT B. LUCHARS
President

EDGAR A. BECKER Vice-President and Treasurer

HAROLD L. GRAY Secretary and Publishing Manager

Advertising Representatives
WALTER E. ROBINSON
DWIGHT COOK
148 Lalayotte St., New York 13, M. Y.

GEORGE H. BUEHLER 228 H. LaSelle St., Chicago 1, III.

NORMAN O. WYNKOOP, Jr. 17597 James Couzens Highway Detroit 35, Mich.

DON HARWAY & COMPANY 1709 W. Eighth St., Los Angeles 17, Celif.

Subscription Rates: United States and Canada, one year, \$4; two years, \$7; three years, \$8; foreign countries, one year, \$7; two years, \$13. Single copies, 40 cents. Changes in address must be received by the fifteenth of the month to be effective for the next issue. Send old as well as new address. Copyright 1922 by The Industrial Press. Entered as second-class mail matter, September, 1894, at the Post Office, New York, N. Y., under the Act of March 3, 1879. Printed in the United States of America.

British Address: National House, West St. Brighton 1, England

U

Total Distribution for October, 24,425



MACHINERY

VOLUME 59 NOVEMBER, 1952

NUMBER 3

The Monthly Magazine of Engineering and Production in the Manufacture of Metal Products

SHOP PRACTICE	*	
Boeing Produces Small Turbo-Jet	Engines	1
Underarm Support Aids Milling a		1
Selecting and Applying Lubricant	to Plain Bearings By Lee Ballard	1
Production Punching on Press Br Cold-Forming of Channels on a V		1
MACHINE AND TOOL DESIGN		
Condensed Review of Some Recen	tly Developed Materials	1
Designing Jigs for Multiple-Spind	le Drilling By Frank G. Zagar	1
Clamping Arrangement for Seali Leakage	ng Castings to be Tested for By Robert S. Newton	1
Air-Powered Electrically Control Table		2
Work-Tilting Device Permits Rac Wheel	dius Grinding with Flat Cup- By Leif Weywadt	2
Useful Shop Gage for Accurate Ch	necking of Tapers By W. M. Halliday	2
Assembling Leader Pins and Bush	nings for Die Sets By Jose Sobkowiak	2
Two-Way Drill Jig Lessens Handli		2
American Standard for Accuracy Lathes (Data Sheet)	y of Engine and Tool-Room	2
MANAGEMENT PROBLEMS AND	MEETINGS	
Defense Agencies Looking to New	Congress By Loring F. Overman	1
Regardless of Election Results		1
Machine Tool Distributors Hold A		2
Unusual Machines Displayed at the		2
The Sales Engineer and His Pro Giving Service	blems—Selling Service versus	2
DEPART	MENTS	
Keeping up with Washington_ 145	The Latest in Shop Equipment	2
In Shops Around the Country_ 188	New Catalogues	
Ingenious Mechanisms 199	Between Grinds	
Tool Engineering Ideas 203 The Sales Engineer 208	News of the Industry	
THE Dates Engineer	AND MILES AND	4

Product Directory 277



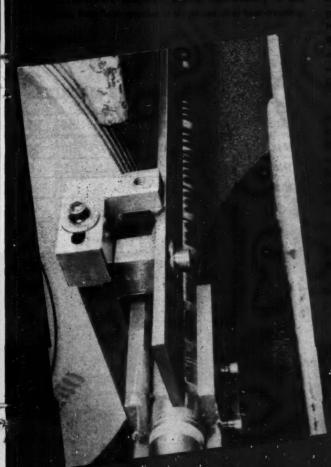
Advertisers Index 435-436



LANDIS Machine COMPANY

THE WORLD'S LARGEST EXCLUSIVE MANUFACTURERS OF THREAD

Centerless Thread Grinders





WAYNESBORO PENNSYLVANIA

GENERATING EQUIPMENT

A Straight Line

FELLOWS GEAR SHAPERS

Machine Nos.	3	7A	36	48	100
Max. P.D. Ext.	3"	7"	36"	_ ~	100"
Max. P.D. Int.	_	6"	36"	72"	100"
Max. Face Width	3/4"	2"	6"	5"	8"
Max. D.P. Spur	*32	5/7	3	4/5	2
Max. D.P. Helical	*32	6	4/5	-	4
Max. Helix Angle	_	45°	45°	_	35°
				*NON-FERR	US MATERIAL

GEAR SHAVING MACHINES

Machine Nos.	4	8	12	18	24
Max. P.D. Ext.	4"	8"	12"	18"	24"
Max. Face Width	1"	2%"	3"	5"	5"
Max. D.P.	20	4	6	4	4
Max. Helix Angle	45°	45°	45°	45°	45°

GEAR SHAPERS
SHAVING MACHINES
THREAD GENERATORS
CUTTERS AND SHAVING TOOLS
GEAR INSPECTION INSTRUMENTS

PLASTICS MOLDING MACHINES

to Precision Gear Quality

THE FELLOWS METHOD

FELLOWS GEAR CUTTING Through the years, the original Fellows Generating Principle (Gear Shapers and Cutters) has continually moved ahead to assure increased high-quality gear production. Such problems as heavier feeds, higher cutter reciprocating speeds, automatic and semi-automatic operation have been solved. Now, cutting takes less time than ever before . . . loading and unloading is substantially simplified.

FELLOWS GEAR FINISHING In addition are Fellows developments of complementary gear production equipment making possible extremely close tolerances on a high-production basis. For example: The Fellows "Fine-Pitch" Gear Shaper, and the No. 4 Gear Shaving Machine have been successful in meeting the requirements for very close limits of accuracy on fine-pitch gears.

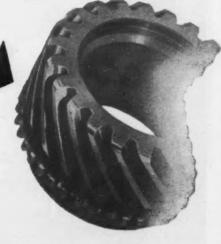
FELLOWS GEAR INSPECTION Supplementing a complete line of production equipment are gear inspection recording instruments that assure accurate and dependable control over the manufacture of high quality gears at the lowest possible cost.

INSPECTION INSTRUMENTS

- Involute Measuring Machines No. 12 & No. 24
- "Red Liners" No. 8 & No. 20
- Lead Inspection Instruments No. 12-H & No. 24-H

Our engineers are available to discuss gearing in all its phases. Call upon us at any time.





THE FELLOWS GEAR SHAPER COMPANY - Head Office and Export Department - 78 River Street, Springfield, Vermont Branch Offices: 323 Fisher Bidg., Detroit 2 - 5835 West North Avenue, Chicago 39 - 2206 Empire State Bidg., New York 1

CINCINNATI

The features and their advantages, tabulated on the opposite page, give CINCINNATI Nos. 2ML and 2MI Milling Machines the highest value for toolroom and job shop equipment. The 2ML's and 2MI's offer a choice of two power ratings; 3hp and 5hp respectively. Complete data in catalog No. M-1662-2. May we send a copy to you?

THE CINCINNATI MILLING MACHINE CO. CINCINNATI 9, OHIO



Every phase of efficient milling practice is discussed in "A Treatise on Milling and Milling Machines." 896 pages of useful, up-to-the-minute information that you can apply today. 200 formulae . . . 700 illustrations and charts . . . 6¼" x 9½" case bound. Price \$8, postage and all taxes included. Send check or purchase order.

CIN

When used to their full extent, features of machine tools are short cuts to reduce maintenance...improve production...simplify operation. A few of the "short-cut" features of CINCINNATI Nos. 2ML and 2MI Milling Machines are listed here. It's to your advantage to consider them carefully when enlarging toolroom facilities, or replacing unproductive No. 2 size machines.



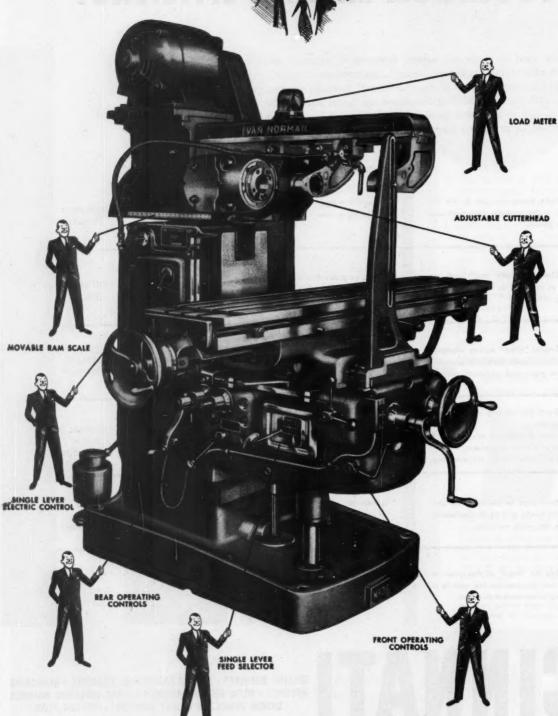
CINCINNATI NOS. 2ML AND 2MI MILLING MACHINES Take heavy cuts, up to the full Dynapoise overarm smooths out DYNAPOISE power of the machine when work and the cutting action. OVERARM fixture permit. 2 Change speeds and feeds as Quick, easy selection of speeds CHANGING often as required to maintain highest and feeds; one-half turn of a SPEEDS cutting efficiency. crank, right or left. 3 Employ "climb" milling whenever Automatic backlash eliminator BACKLASH it is advantageous. Especially desirable (extra equipment). Activated ELIMINATOR for thin parts and reciprocal milling. during feed stroke; free during rapid traverse. 4 Treat your milling machine with Constructed for long life of continuous service . . . anti-friction consideration: VERTICAL bearings throughout . . . higha) Do not use table as an anvil, or T-SCREW quality castings of selected slots to tighten dog screws. LUBRICATION grades of iron . . . automatic b) Fill oil reservoirs as recommended. lubrication. 5 Stand close to the operating con-STARTING Spindle drive starting lever may LEVER be adjusted to suit working potrols and levers, and be as comfortable 360° PLACEMENT as you can while working. sition. 6 Note the "hand" of the cutter (rh Conveniently located spindle reverse lever, with instruction or Ih) and be sure that the spindle is DIRECTION rotating in the correct direction. LEVER

CINNATI

MILLING MACHINES - CUTTER SHARPENING MACHINES - BROACHING MACHINES - METAL FORMING MACHINES - FLAME HARDENING MACHINES OPTICAL PROJECTION PROFILE GRINDERS - CUTTING FLUID



Look at the



"IT PAYS TO VAN NORMANIZE"

8-MACHINERY, November, 1952

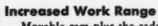
Production Advantages of the VAN NORMAN RAM TYPE MILLER

Regardless of the type of plant or the type of work, Van Norman Ram Type Millers can cut your milling costs and speed vital production. These versatile millers reduce idle machine time by as much as 50% because they enable the operator to perform conventional horizontal, vertical and angular milling on one machine. Look at what Van Norman Ram Type Millers can do for you—



Adjustable Cutterhead

By merely positioning the cutter head, the operator can perform horizontal, vertical og angular milling . . . the work of three single-purpose machines.



Movable ram plus the saddle crossfeed increase the work range and capacity of the miller . . . enable you to handle larger work pieces with ease.

Front and Rear Controls

Operating controls are located at front and rear for ease of operation. They eliminate back and forth operator motion . . . reduce operator fatigue.

Simplified Electric Control

Built-in electric controls simplify operation. Single lever selector controls spindle, feed, and coolant. Push button, on front of knee, starts and stops motors as pre-selected.

Load Meter

Built-in load meter indicates percent of load at which the cutter is operating. It enables the operator to operate miller at maximum efficiency . . . helps to prevent overloading of the miller motor.

Any way you look at it, the Van Norman No. 38 Ram Type Miller is your best buy for cutting costs, increasing production and accuracy.

Van Norman Ram Type Millers are available from 37" to 64" table lengths.

Write for complete information, today.

VAN NORMAN COMPANY Springfield 7, Massachusetts

Electrolux Increases Armature

Landis 4" Plain Grinders replace equal number of older machines

Here is another example showing how Landis grinders have improved production and lowered costs.

Armature shafts at Electrolux were formerly ground on older machines which required time-consuming hand operations. The new Landis 4" type H plain



LANDIS

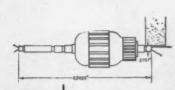
precision grinders

Landis 4" Type H Plain Grinder Ask for Catalog A-49

Grinding Output 40%

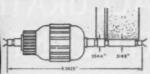
grinders with hydraulically operated rapid wheelbase movement, slow grinding feed, timed cycle and visual sizing gauges have made these gains possible.

Whatever your grinding problem—our engineers will be glad to make production estimates and tooling suggestions from your work prints.



work data

PRODUCTION **OPERATION** STOCK REMOVAL TOLERANCE 350 pieces per hour grind small bearing .012" to .015" .0002" on diameter



work data

PRODUCTION **OPERATION**

STOCK REMOVAL TOLERANCE 210 pieces per hour grind large bearing and fan diameter .012" to .015" .0002" on diameter

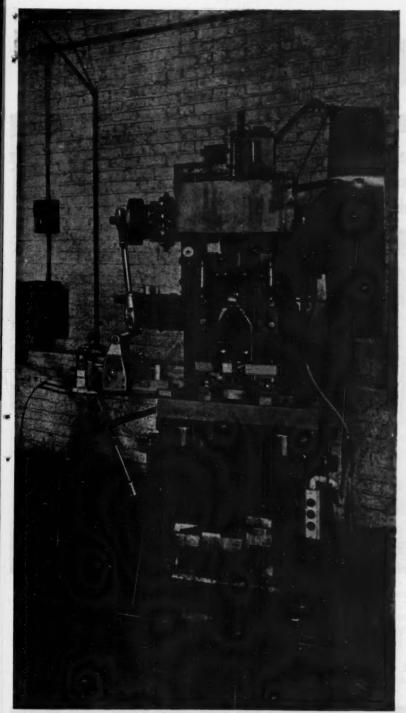
151

LANDIS TOOL COMPANY / WAYNESBORO, PENNA., U.S.A.

U.S. SLIDE FEEDC

ASSURE
ACCURATE
EFFICIENT
AUTOMATIC
PRESS ROOM
OPERATIONS





HIS photograph shows a battery of presses, all equipped with U. S. Slide Feeds, at Alcon Metal Products Company in Chicago, Illinois. As with other users of U. S. Slide Feeds, Alcon Metal Products Company is gaining the advantages of automatic operation plus controlled accuracy.

When using U. S. Slide Feeds, the press is converted into an automatic machine. All the operator has to do is to load coils of material on a Stock Reel or Cradle.

Besides allowing for automatic operation, the U. S. Slide Feed is generally recognized as the most accurate Feed on the market for feeding the material into presses. The slide block which contains the blade to grip the material reciprocates on hardened and ground slide rods between definite stops. Further, the U. S. Slide Feed can pull material within its capacity through a plain Straightener and still maintain controlled accuracy.

If your production program involves press operations requiring accurate feeding of material, we believe you will be interested in the advantages obtainable through the use of U. S. Slide Feeds.

Ask for a copy of Bulletin 80-M on U. S. Automatic Press Room Equipment, which includes U. S. Slide Feeds, Roll Feeds, Stock Straighteners, Stock Reels and Coil Cradles.

COMPANY, Inc. AMPERE (East Orange)
NEW JERSEY

This high-priority job demands



THOUGH complete production data must be withheld for security reasons, A. V. Roe Canada, Ltd., reports three G&L Horizontal Boring, Drilling and Milling machines are making an important contribution toward increased production of the Orenda jet engine.

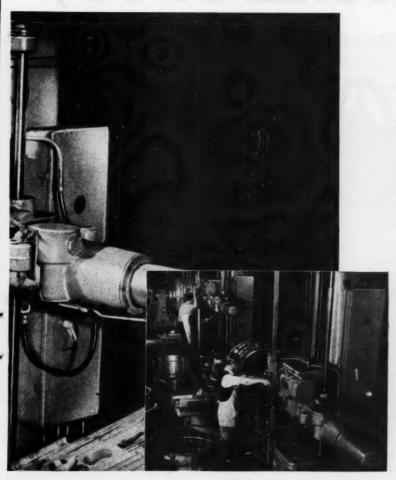
These machines are equipped with the G&L automatic electric positioning device. This outstand-

ing feature allows fast positioning of the casting accurate to within tenths of .001".

Like A. V. Roe, you too will find that for your work... big or small... simple or complex... you'll save time and money with the G&L line. Maybe you'll want a G&L Horizontal Boring, Drilling and Milling machine—or a G&L Hypro Planer, Planer-Miller or Vertical Boring Mill. But what-

GIDDINGS & LEWIS Toble Type Horizontal Boring Machine Boring Machine Boring Machine

extra-close tolerances



Photos show G&L 340-T's working on jet compressor castings. Note small revolving table mounted on standard table which speeds positioning.

ever your need, you can be sure that G&L's unbiased Job Analysis Service will give you an answer that will mean savings. See our nearest representative or write direct. Get the facts about G&L Job Analysis today. There's no obligation . . . and DELIVERY ON G&L MACHINES MIGHT BE BETTER THAN YOU THINK!

G&L 5-POINT JOB ANALYSIS

takes the guesswork out of machine tool buying..works for you and with you to solve big or complex machining problems..increases production .. reduces machining costs

- COMPLETE STUDY OF YOUR JOB OR JOBS

 Gat. Job Analysis Engineers, working with your engineers, analyze your requirements by:

 (1) number and size of parts to be produced
 (2) number and kind of operations needed
 (3) tolerances and finishes required,
- DETERMINE MOST EFFICIENT MACHINING METHOD Taking into consideration the individual machining requirements of the job, G&L Job Analysis Engineers choose the most efficient machining method. G&L engineers can give an unbiased opinion because G&L builds a complete line of sizes and types of planers, planer-millers, vertical boring and turning mills and horizontal boring, drilling and milling machines . . . plus a complete line of accessories and tooling for these machines.
- SELECT THE SIZE, KIND AND TYPE OF MACHINE—The machining method now determined, GeL Job Analysis Engineers—using your production and work requirements—recommend the exact size, kind and type of machine that will do the job most efficiently.
- PLAN YOUR OPERATIONS After the selection of the most efficient machine to fit your needs, G&L Job Analysis Engineers plan a sequence of operations that will (1) minimize number of setups and setup time, (2) use modern cutting tools to best advantage, (3) take full advantage of the machine working ranges and capacities, (4) keep operator fatigue to a minimum.
- pacities, (4) keep operator fatigue to a minimum.

 RECOMMEND (AND DESIGN IF NECESSARY)

 THE TOOLS TO USE If conditions warrant,
 G&L will recommend the standard machine
 accessories, arrangements and tools you can use
 to make your equipment more productive—more
 versatile in application. If special equipment is
 needed, it will be designed to agreed specifications and made a part of your order.

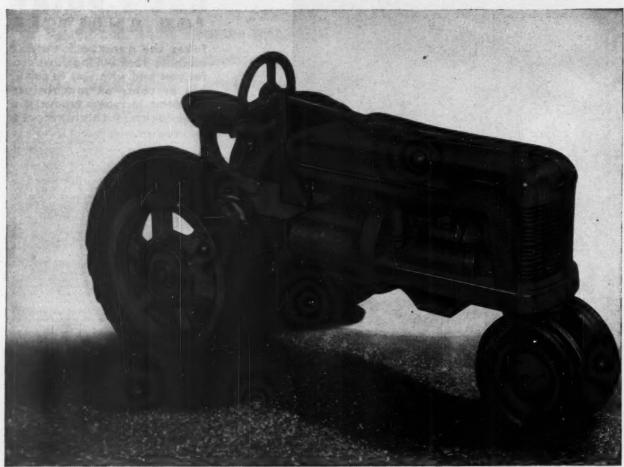
Write, wire or phone Gall or its nearest representative today. Get the facts on your needs — your problems. Get a Gall ambiated by Analysis to belp you. Don't besistate — there's no obligation. AND DELIVERY MAY BE BESTER THAN YOU THINK!

How to get a GaL job analysis

Call your nearest G&L dealer or write us direct. Furnish our Job Analysis Engineers with blueprints, job data, and production requirements. Factory engineers will completely analyze your machining problems. There's no charge, no obligation. Don't hesitate — do it today.

Hypro Planer Type Milling Machine Housing Planer Housing Machine Housing Planer Type Milling Machine Housing Planer Housing Mill Turning Mill Turnin

STORY OF A TOOL,



took at that model! — so real you can almost hear the motor roar! Scale: 1/16" to 1". Accurate molds like the one that

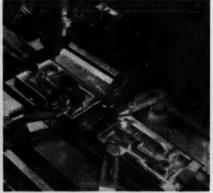
made this tractor are ideal jobs for Kearney & Trecker-Milwaukee Rotary Head Milling Machines.



Here's a close-up of one of the form cutters and one of the female halves of the mold. Note smooth finish.



Set-up for milling two halves of mold not changed until job is done. This insures faster and more accurate results.



Another set-up for milling mold halves. Note the gleaming final finish — very little or no hand finishing required.

A TOY AND A MOLD

Illustrated example of how the Rotary Head Method of Milling can solve highly complex milling problems . . .

SEE that scale model of a famous farm tractor — notice the fineness of detail!

Would you believe that one machine was capable of reproducing those details in the mold — that no models or templates were used — that all the machine operator needed was a set of blueprints?

Yes, that is exactly the case. The Kearney & Trecker-Milwaukee Model 2D Rotary Head Milling Machine has this amazing versatility.

this amazing versatility.

It can reproduce geometric shapes in both horizontal and vertical planes! All the operator has to do is be able to read a blueprint and work simple mathematics!

On the job, the operator worked from scale reductions of real tractor

assembly prints—only the most minute details eliminated. Workpiece material was oil-hardening tool steel. Results? The Rotary Head Milling Machine was Fast, Direct, Accurate.

Fast, because there was no delay in getting the job underway — no extra operations.

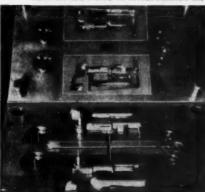
Direct, because the blueprint dimensions were transmitted immediately into metal.

Accurate, because the precise control of all cutting operations is built right into the machine.

If you have an unusual production problem—it will pay you to investigate the Model 2D Rotary Head Milling Machine — For complete data write for Bulletin D20 — Kearney & Trecker Corporation, Milwaukee 14, Wisconsin.



Photos and data courtesy of: Product Miniature Co., Inc., Milwaukee, Wisconsin



The completed mold. Note wheel mold parts. All contours for hubs, spokes milled on Rotary Head machine.



Here's one of the finished thermoplastic parts just as they come from the mold...ready to cut, trim and assemble.



Model 2D Rotary Head Milling Machine. Helps you machine production parts, dies, molds and other jobs by the Rotary Head Method.

MACHINERY, November, 1952-17

Brand Mem

and

A STANDOUT FOR SPEED, CAPACITY AND TOP QUALITY LAPPING

Norton's Single Face Lapping Machine with Bonded Abrasive Laps Saves On Jobs Up to 60"... A Sensational Performer Particularly On Soft Metals

Here's the greatest advancement ever made over old methods of lapping with loose abrasives. Norton's new single face, flat lapping machine combines a bonded abrasive lap with many other efficiencyboosting features to assure amazingly better, lower cost results.

You'll find these factors, plus ample capacity, make it the outstanding machine for lapping large castings of gray iron, aluminum, brass, magnesium and other soft metals. And on metals of every degree of hardness its faster, smoother performance will save you time and money throughout a long, trouble-free service life.

TYPICAL ADVANCED FEATURES

Hydraulic Pressure Device. Makes up for any lack of weight in work by applying correct compensating pressure for best lapping control.

Power Operated Truing Arm. Fully adjustable, providing slow to rapid traverse across lap. Simplifies maintenance of desired finish throughout the life of the lap.

Loadless Starting, Inertia Delay Clutch. Assures smooth pickup and even torque.

Automatic Operation. Requires only loading of machine and push-button starting to complete the electrically timed work cycle.

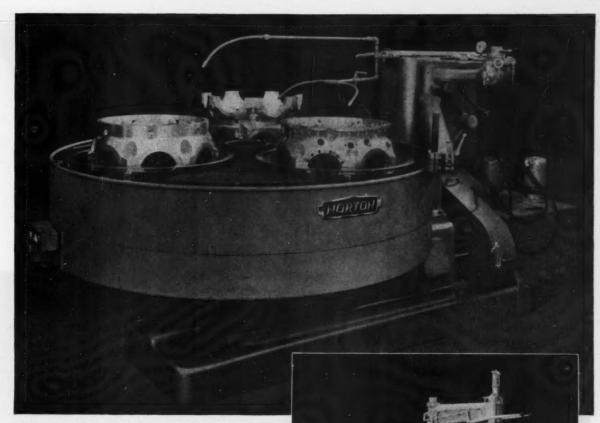
Large Capacity Range. Includes lap sizes of 48", and 60". Maximum size enables handling of three 24" pieces or one 60" piece (largest dimension).

POSITIVE ADVANTAGES

Cleaner Work. Coated only by a thin, filtered oil, the surfaces finished by bonded abrasive lapping are free from the sludge left by loose abrasives.

Brighter Surfaces. Bonded abrasive lapping produces brighter surfaces on any metal, with no later polishing required.

Safer. By keeping the pores and crevices of the metal free from imbedded grit, the bonded abrasive enables



BONDED ABRASIVE LAPPING of aircraft engine housings reaches peak efficiency in the New Norton 60" Single Face Flat Lapping Machine. For faster stock removal, work is driven in opposite direction to its normal tendency to rotate.

safe lapping of soft metals to provide seal surfaces, wear surfaces, or surfaces for drilling or milling. This also eliminates the need of thorough cleaning after lapping, to rid surfaces of imbedded abrasive.

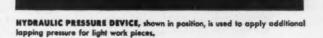
Faster. Cutting speed, on many materials, is 2 to 5 times faster than loose abrasive lapping for the same amount of stock removal.

More Accurate Products. The simple, positive laptruing device results in maximum product-accuracy on every job.

Greater Economy. Bonded abrasive laps are longlasting and easy to replace. A low priced coolant is used. Inspection tools are subjected to less wear than on parts lapped with loose abrasives. Labor expenses for extra cleaning and polishing operations are eliminated. And with Norton laps made to match Norton machines exactly, you get an unbeatable cost-cutting combination.

FOR COMPLETE DETAILS

see your Norton Representative or write us direct.
NORTON COMPANY, Machine Division,
Worcester 6, Mass;



To Economize Modernize With NEW



GRINDERS and LAPPERS

Making better products to make other products better

District Sales Offices: Hartford • New York • Cleveland • Chicago • Detroit
In Canada: J. H. Ryder Machinery Co., Ltd., Toronto 5



They catch on fast — this new generation of up-and-coming production men. And one of the first things they learn is the fact that Morse Cutting Tools . . . supplied by competent Morse-Franchised Distributors . . . mean substantial savings all along the line, in time,

Take End Mills, for instance. What do you need? Here are all types of short or standard mills, single or double-end. Also, types with left-hand spiral but right-hand cut to push chips ahead . . . ball-end for die cavities, fillets, and round-bottomed holes or slots. Here are two lip styles with single or double-end, for plunge-cutting. Here are taper shank styles you

can use direct in machine spindles. And here's the old reliable shell design, for face or slab milling. Not to mention a wide range of lengths in Morse's exclusive Hi-Helix shear-cutting design.

From among all these, you can get exactly the right mill for your job from your Morse-Franchised Distributor. You can profit from his full experience and full line of Morse Cutting Tools. Call him in, today.

MORSE TWIST DRILL & MACHINE COMPANY NEW BEDFORD, MASS.

(Division of VAN NORMAN CO.)

Warehouses in New York, Chicago, Detroit, Houston, San Francisco

MORSE

... buy them by phone from your Morse-Franchised
Distributor and save ordering time



MACHINERY, November, 1952-21

High Production Taps

You got top partitudien, long life, has uniform tupped help after from Winte. Nib. Taps—the taps with "Bulanced Action" built into them.

WINTER BROTHERS COMPANY Rochester, Michigan, U.S.A.

Distributors in principal diffes. Branches in New York, Detroit, Chicago, San Francisco. Division of National Twist Drill & Tool Co.

ALWAYS AT

Hilling



Your local industrial Supply Distribute corries a complete stock of WINTER Tax





Mittinguil

DEMAND

NATIONAL

TOOLS

Your demands for utmost performance, economy, and dependability in cutting tools are met in the complete NATIONAL line, including Twist Drills, Reamers, Counterbores, Milling Cutters, End Mills, Hobs, and Special Tools. Each carries the NATIONAL name, long famous for sound engineering and skilled craftsmanship.

NATIONAL TWIST DRILL AND TOOL COMPANY Rochester Michigan U.S.A.

Distributors in principal cities. Factory Branches:



CALL YOUR
INDUSTRIAL SUPPLY
DISTRIBUTOR

... for all your staple industrial needs including NATIONAL Twist Drill's Reamers, Counterbores, Milling Cutters, End Mills, Hobs, and Special Tools.

To make the years ahead even more productive

LELAND-GIFFORD announces a new

No. 3 MVB 24" SWING-HEAVY DUTY DRILLING MACHINE

This new Leland-Gifford No. 3 MVB is the ultimate result of more than a half century of drilling machine development and improvement. It is a heavier, more rugged, yet easier to operate machine available in any combination of one to four spindles - two or eight speed with semi-automatic power feed - capacity of No. 3 or No. 4 Morse taper. Write for complete information.

NOTE THESE FEATURES

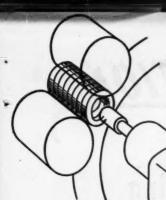
- Totally enclosed, fan cooled, ball bearing NEMA motor mounted at rear and driving through V belt.
- 20-tooth involute spline spindle for greater rigidity, less wear. Spindle independently counterbalanced with preloaded radial and thrust bearings and continuous lubrication.
- Two speeds or eight standard speeds with single or four speed motor and back gearing.
- e Indicating shift provides instant speed changes no complicated transmission.
- · Power feed with three feed rates for each spindle speed, adjustable depth stop and safety slip clutch.
- Built-in light for each spindle.
- Box type ribbed table with platen machined to surface plate accuracy.
- Base, column and table ruggedly built for maximum rigidity.

SAVE DAYS - CONTACT THE OFFICE NEAREST YOU

LELAND-GIFFORD

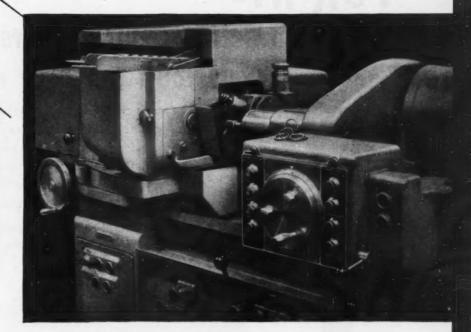
Drilling Machines

WORCESTER 1, MASSACHUSETTS, U.S.A



Mere's Mow the Meald handles a multiple grinding job





valve seat inserts ground BAT A TIME on a Heald Model 281 Centerless

With this fully automatic Heald Centerless Internal, valve seat inserts are ground eight at a time. The parts are stack loaded and drop into grinding position automatically, where they are located and rotated between the support, pressure and regulating rolls. Since they are rotated on their own outside diameter, concentricity between ground bore and O.D. is easily maintained. Size-Matic sizing is also fully automatic. Once the machine is started, all the operator has to do is keep the loading chute filled and remove the finished parts from the unloading chute.

This is typical of the high production efficiency that you can get with a Heald Centerless Internal. Remember — when it comes to precision finishing, it pays to come to Heald.



Heald precision special the nations production

THE HEALD MACHINE COMPANY

WORCESTER 6, MASSACHUSETTS

Branch Offices: Chicago . Cleveland . Dayton . Detroit . Indianapolis . New York

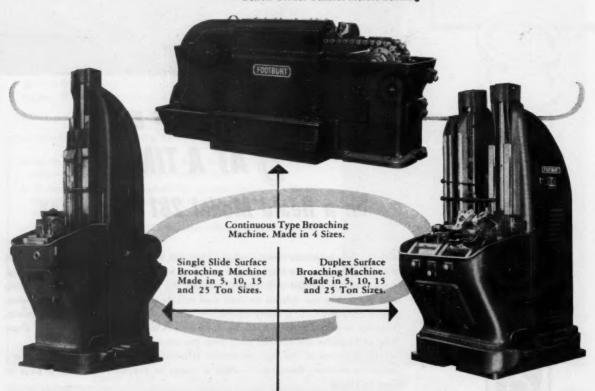
FOR HIGHER PRODUCTION

investigate surface broaching for difficult machine work

• Many types of work can be surface broached on Footburt machines at remarkable savings over previous machining methods. High production is obtained with required accuracy and finish. Holding fixtures are designed for quick, convenient loading. Cutting tool maintenance costs are low. We will be glad to work with you on the application of surface broaching.

THE FOOTE-BURT COMPANY · Cleveland 8, Ohio

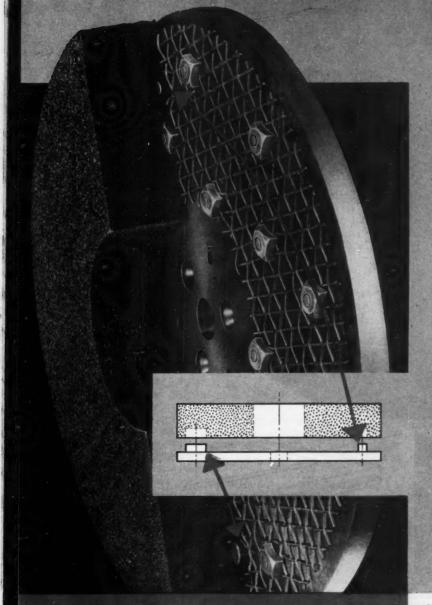
Detroit Office: General Motors Building



FOOTBURT

surface broaching

Compare the Grinding Precision of This Abrasive Disc With Other Makes



Grinding to close tolerances is no problem with Gardner abrasives. Precision work is made easier because factory trueness is maintained throughout the entire life of the disc.

On Gardner discs provided with the Tru-Lok feature, it's impossible to make an off center mounting. On job after job maintaining trueness assures better finishes and closer tolerances. Doweled Tru-Lok mounting aligns the holes in the abrasive and the steel wheel.

This exclusive Gardner feature is another reason why Gardner Abrasive Discs are first choice among users of flat surface grinders. New Gardner grinders are equipped with the Tru-Lok feature. It can also be made available for older machines.

Gardner engineers abrasive discs to fit specific grinding requirements. For help with your surface grinding problems, call the nearest represent-

ative in our nation-wide service organization.



GARINER abrasive discs

Technical Literature Dept.

GARDNER MACHINE COMPANY
Beloit, Wisconsin

107A

Please send me the Gardner Guidebook for Surface Grinding.

NAME.....

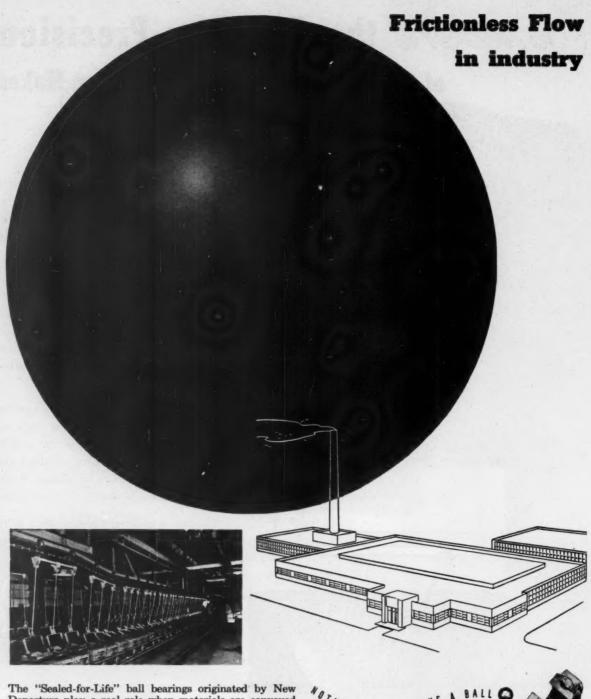
TITLE

THE .

COMPANY.

ADDRESS.....

CITY______ZONE___STATE



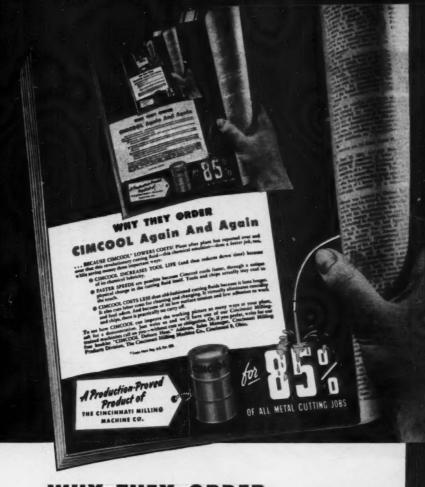
The "Sealed-for-Life" ball bearings originated by New Departure play a real role when materials are conveyed mechanically. Overhead or underground . . . carrying sand or steel . . . moving coal or castings . . . conveyor systems equipped with N-D Ball Bearings reduce handling costs.

With grease sealed in and dirt sealed out, these bearings resist loads of all kinds for years without adjustment. It is not unusual to find installations that were made twelve to fifteen years ago still in efficient, effective operation.

The Great Ball of New Departure symbolizes engineering excellence—and New Departure's application engineers and research facilities are always at your disposal. Keep your eye on the BALL to be sure of your BEARINGS!



NEW DEPARTURE - DIVISION OF GENERAL MOTORS - BRISTOL, CONNECTICUT



WHY THEY ORDER CIMCOOL Again And Again

... BECAUSE CIMCOOL° LOWERS COSTS! Plant after plant has reported over and over that this revolutionary cutting fluid—this chemical emulsion—does a better job, too, while saving money three important ways:

- CIMCOOL INCREASES TOOL LIFE (and thus reduces down time) because of its chemical lubricity.
- FASTER SPEEDS are possible because Cimcool cools faster, through a unique physical change in the cutting fluid itself. Tools and chips actually stay cool to the touch.
- CIMCOOL COSTS LESS than old-fashioned cutting fluids because it lasts longer.
 It also cuts labor costs for cleaning and changing. It virtually eliminates rancidity and foul odors. And because of its low surface tension and low adhesion to work and chips, there is practically no carry off.

To see how CIMCOOL can improve the working picture so many ways at your plant, ask for a demonstration. Just write us and we'll have one of our Cincinnati Milling-trained machinists call on you—without cost or obligation. Or, if you prefer, write for our free booklet "CIMCOOL Defeats Heat." Address, Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

*Trade Mark Reg. U.S. Pat. Off.

A Production-Proved

Product of

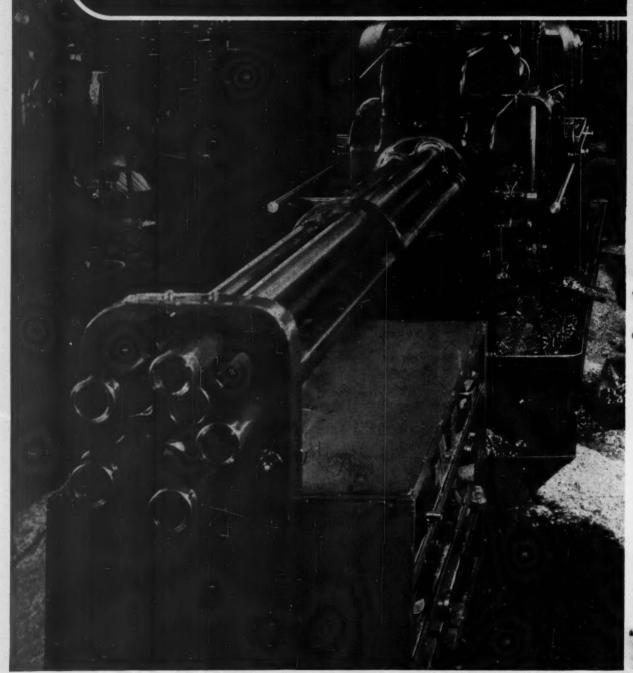
THE CINCINNATI MILLING

MACHINE CO.



of all Metal Cutting Jobs

Warner & Swasey Automatics are cutting



Warner & Swasey S-Spindle Automatic Bar Machines in operation at Colson Corporation, Elyria, Ohio

YOU CAN MACHINE IT BETTER, FASTER, FOR LESS . . . WITH WARNER & SWASEY

30-MACHINERY, November, 1952

costs for Colson Corporation Nationally known manufacturers of Casters, Material Handling Trucks, etc.



• Setup time cut more than 50% on new Warner & Swaseys. ● Production up 7 to 8 times on lots of 500 to 10,000 pieces.

the Colson story

- "Progressive" setups are much more practical on Warner & Swaseys.
- Small lots are economically practical on this new **CAMLESS Automatic.**
- Machine operators appreciate easy access and interchangeability of tooling.
- Both management and operators approve - NO CAMS TO CHANGE.
- Five repeat orders prove the profitability of Warner & Swaseys.

WARNER **SWASEY** Cleveland

TURRET LATHES, MULTIPLE & SINGLE SPINDLE AUTOMATICS AND TAPPING MACHINES

MACHINERY, November, 1952-31



When job specifications leave no leeway, when extreme tolerances must be maintained...that's when the built-in precision and absolute tolerance control of Grand Rapids Grinders proves most valuable. Defense commitments make it im-

possible for us to fill your orders as rapidly as we'd like to . . . but we know our customers can appreciate the reasons for delay. As always, we're doing our best to serve you. GALLMEYER & LIVINGSTON CO.

305 Straight Ave., Grand Rapids, Mich:



GRAND RAPIDS GRINDERS

... the very best

Manufacturers of SURFACE GRINDERS * CUTTER and TOOL GRINDERS * TAP and DRILL GRINDERS



VEEDER-ROOT

Aerial navigators and bombardiers rely on the figures that keep turning up on this Veeder-Root Counter, specially designed for the Armed Forces. And if you need to know exactly where you are, with any product or mechanism that's vital to Defense, then you can

count on Veeder-Root to help you, to the utmost limits of ability . . . and of available capacity. Write:

VEEDER-ROOT INCORPORATED
"The Name That Counts"
HARTFORD 2, CONN.

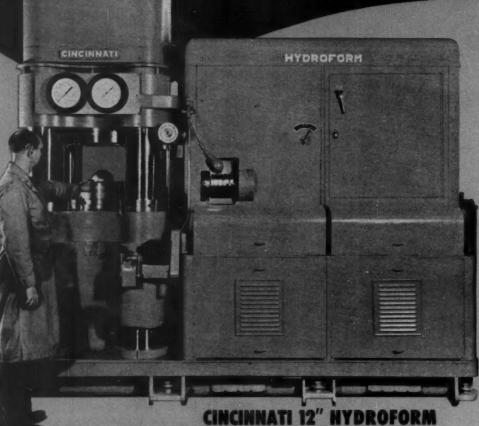
Chicago 6, Ill. • New York 19 • Greenville, S. C.

Montreal 2, Canada . Dundee, Scotland

Offices and agents in principal cities



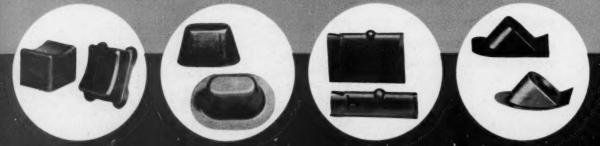
Hydroforming



EASY-TO-PRODUCE MALE PUNCHES MATERIALLY REDUCE TOOL COSTS

Shown below are typical examples of the simplicity of Hydroform tooling.

Other machine sizes are available having a work capacity (max. blank dia.) of 19", 23", 26" and 32". Information on machines of larger capacity furnished on request.



cuts the cost of tooling for deep draw work

TOOL COSTS CAN RUN AS LOW AS 10% OF CONVENTIONAL DIE SET COSTS!

Hydroforming is deep drawing by use of a male punch working upward into a *flexible die member*... a builtin feature of the Cincinnati Hydroform that replaces more than balf the parts of the conventional draw die.

Hydroform tooling consists simply of a punch of the desired shape, and a draw ring contoured to fit around the punch. Normal clearance between the punch and draw ring is 50% or more of the thickness of the material being formed—eliminating a costly die-maker's fit.

Punches can be made of untreated steel, cast iron, hard woods, Kirksite, brass, aluminum, or other easily worked materials, depending on the quantity and shape of the part. Punch maintenance is minimized as the cushioned action of the flexible die member reduces punch wear.

The tools are self-centering and easy to locate in the machine. Set-up and changeover of tooling is accomplished rapidly.

Low cost tooling is a major Hydroforming advantage. However, Hydroforming brings to deep drawing many other benefits:

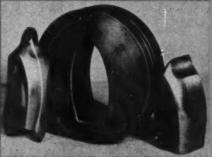
Most parts can be produced in a single draw—eliminating multiple operation processing.

Practically any shape can be formed from a wide variety of materials up to steel %" thick.

Part quality is materially improved. Surface finish is unimpaired.

Investigate Hydroforming now. It will change your thinking on deep drawing and forming! Call in your nearest Cincinnati Milling Machine Co. field engineer for a factual discussion of how Hydroforming can cut the cost of your metal forming work. For detailed information on Hydroform machines and the Hydroforming principle, write for Bulletin M-1759.

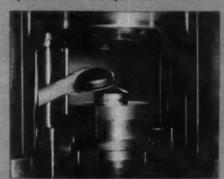




PART DRAW RING PUN

Shown above are the basic elements of Hydroform tooling—a draw ring and punch.

A close-up view of tooling installed in the Hydroform is shown below. Only 7½ hours were required to produce the draw ring and punch from mild steel. The part shown is a high pressure vessel cap of ¾" mild steel, Hydroformed in one operation.



LONG LIFE.

1

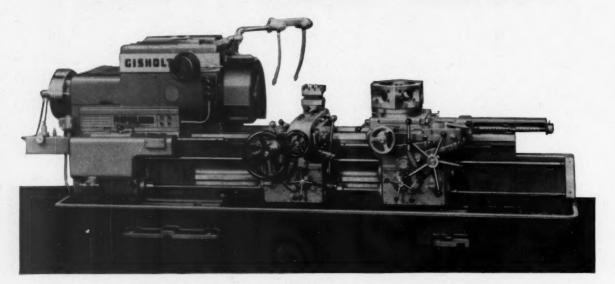
All gears in Gisholt turret lathe transmissions are high carbon alloy steel, precision ground after heat-treatment to assure long wearing quality. All shafts turn on antifriction bearings, with pressure spray lubrication. Headstock is cast integral with bed for extreme rigidity—to maintain accurate, permanent alignment.

2

Gisholt's thick, block-type ways are automatically pressure lubricated. Made of SAE 52100 tool steel, they are deep hardened to 64-66 Rockwell C and then finish-ground for exact alignment with the spindle. On top, bottom and both sides, they present a bearing surface that is virtually wear-proof—accurate for years to come.

3

Aprons are fully enclosed, all working parts protected and operating in a continuous cascade oil bath. Alloy steel gears and shafts are mounted on antifriction bearings. Positive serrated feed and traverse clutches cannot slip or drag. Safety shear pins protect feed and traverse mechanism against overload and accident.



You'll find all the speed and easy operation you want in these new Gisholts. But you want long life, too. Here's the lasting accuracy, freedom from repair bills and proved performance that protect your turret lathe investment for years to come.

GISHOLT PANY MADISON 184

THE GISHOLT ROUND TABLE

represents the collective experience of specialists in the machining, surface-finsisting and balancing of round and partly round parts. Your problems are welcomed here.

, Wisconsin

TURRET LATHES . AUTOMATIC LATHES . SUPERFINISHERS . BALANCERS . SPECIAL MACHINES

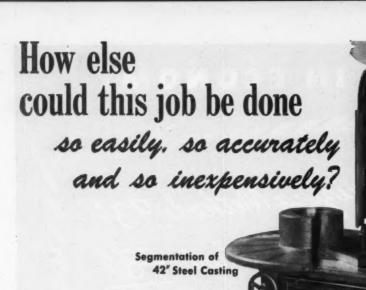
LESSON IN ECONOMY Carburizing Method-93¢ TOCCO Method-48¢ Savings per pin 45¢ ith TOCCO* Induction Heating

- When a leading motor truck manufacturer switched to TOCCO for surface hardening steering knuckle pins, they not only cut the cost of the part in half, but reduced heat-treating time from 17 hours to 48 seconds!
- Using TOCCO they were able to combine two operations and eliminate four others completely. Moreover, the TOCCO unit, being located right in the production line next to related operations, saves
- approximately 4000' of hauling to and from the heat-treat department - an important economy factor not included in the above figures.
- If your operations involve the hardening, brazing, soldering, melting or forging of ferrous or non-ferrous metals, TOCCO can probably speed up your production and lower your costs, too. Why not ask to have a TOCCO engineer survey your plant for similar cost-cutting results—without obligation.

THE OHIO CRANKSHAFT COMPANY . CLEVELAND 1, OHIO



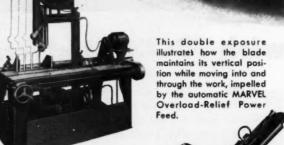
Induction Heating Equipment must meet the requirements of the Federal Communication Commission's Rules and Regulations Relating to Industrial, Scientific and Medical Services, Part 18. All TOCCO equipment is certified to comply with these rules and regulations.



Every tool room, machine shop, die shop and maintenance department needs at least one No. 8 MARVEL Metal-cutting Band Saw for cutting off anything from 1/4" drill rod to bars or billets of 18" x 18" cross-section . . . for roughing large work to size and shape, thereby saving hours of machining . . . for those occasional "trick" of machining . . . for those occasional "trick" jobs, impossible on any other saw, that bob up

odd shapes that can't be held in the removable, quick-action vise, are easily set-up on the No. 8's large, T-slotted work table. MARVEL Overload-Relief Power Feed insures accurate cuts under the most adverse conditions because blade pressures are automatically held within limits which are pre-set instantly for each job. The blade is never forced beyond its capacity to effi-

ciently and accurately remove metal . . . Close limits are further assured through the work being clamped rigidly to the bed of the saw and the blade power-fed through it instead of pushing the work through the blade. This is also true in miter cutting, as the blade column—not the work—is swung to the required angle. The handiest, most versatile machine tool, it is also the busiest in most shops.



Column set at angle to cut 45° miter on 18" beam. Entire saw column can be swung to cut at any angle from vertical to 45° right or 45° left.



Metal Cuttin

Write for Catalog

ARMSTRONG-BLUM MANUFACTURING CO. **5700 Bloomingdale Avenue**

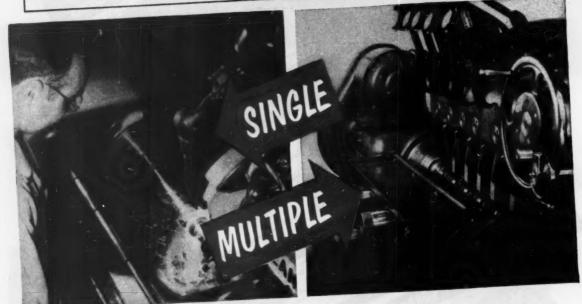
"The Hack Saw People"

Chicago 39, U. S. A.

CONVEYOR ROLL This bulletin contains complete information on BEARINGS M-R-C CONVEYOR ROLL BEARINGS File it with your Boll Bearing Data Four Important Features · Freedom from need of lubricating All exterior surfaces rust-resistant Easily replaceable Recuising in: Reduced mechining operations Cheaper mounting costs Reduced belting cost Improved belt alignment MARLIN-ROCKWELL CORPORATION JAMESTOWN, Send for your copy of this 4-page bulletin No. 1529 MARLIN-ROCKWELL CORPORATION Executive Offices: JAMESTOWN, N.Y.

Cylindrical





Only CARBO

"Carborundum" and "Aloxite" are registered trademarks which indicate manufacture by The Carborundum Company, Niagara Falls, New York.

40-MACHINERY, November, 1952

Grinding



Cylindrical Grinding Wheels by CARBORUNDUM give you the right combination of aluminum oxide grain and vitrified bond—the combination that, on your specific job, spells highest output at lowest cost.

ABRASIVE GRADES

ALOXITE "A"—a more friable type of regular aluminum oxide grain for roughing and finishing on soft to medium hard stock.

ALOXITE "AA"—chemically pure type of aluminum oxide grain, extremely friable and thus ideal for grinding heat-sensitive, hard alloy steels.

ALOXITE "DA"— blend of "A" and "AA" grain types. Cuts cool and fast on the harder heat treated steels.

VITRIFIED BONDS

"V10"—cool cutting, yet tough... the standard structure is superior on form grinding work and wherever finish is more important than stock removal.

"V11"—for moderate to heavy stock removal. Very cool cutting, with a more open structure that promotes high cutting rates. Holds corners well. Widely preferred on crankshaft work.

"V12"—a very open structure uniquely successful on large crankshafts. Generates a precision finish, free from burns, on difficult work involving large areas of contact, high sidewalls and large pin diameters.

And for cylindrical grinding of low tensile materials, CARBORUNDUM silicon carbide wheels, in two types of abrasive grain and two types of vitrified bond, deliver the same high-output, low-cost production on cast iron, aluminum, brass, etc.

ORDER FROM YOUR CARBORUNDUM DISTRIBUTOR TODAY. He's your best bet for complete stocks, prompt delivery, experienced counsel on latest developments in the field. You'll find him listed in the yellow pages under "Abrasives." Phone him today—it's to your profit!

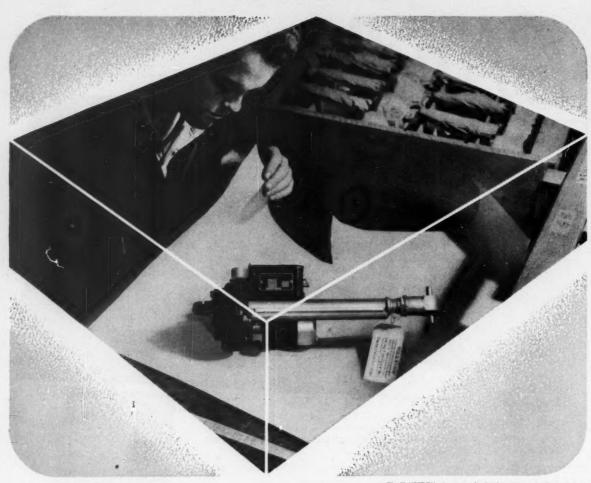


Write Dept. M 81-83 for your copy

RUNDUM

offers ALL abrasive products...to give you the proper ONE

MACHINERY, November, 1952-41



Shell "VPI"-protected airplane parts. Over 1,000 different parts stored for over a period of a year—all wrapped in Shell "VPI" paper—no rejects due to rusting.

New packing technique HALTS RUST DAMAGE . cuts packing costs as much as 60%

THE GOOD WORD AMONG steel packagers and shippers today is that rust can now be prevented by Shell VPI® (a volatile corrosion inhibitor). Composed of solid amine nitrites, Shell "VPI" vaporizes and when moisture is present in the air . . . renders this moisture noncorrosive. Containers need not be airtight, however, for excellent corrosion protection.

In terms of packing costs, this new technique is so much simpler and faster that costs have been cut as much as 60%.

This can be traced directly to the fact that Shell "VPI" may be applied quickly and easily in either crystalline form or as a coating on wrapping paper. Hence rustpreventive measures are greatly simplified and container costs are reduced. And, of course, rust removal before the product's use is unnecessary.

Other major advantages of Shell "VPI" are: Low cost . . . Long periods of volatility ... Nontoxic ... Elimination of greasing and degreasing . . . Harmless to plastics or ferrous metals.

Consult your Shell Representative about this new method of rust prevention today. Or write to nearest address listed below.

SHELL OIL COMPANY

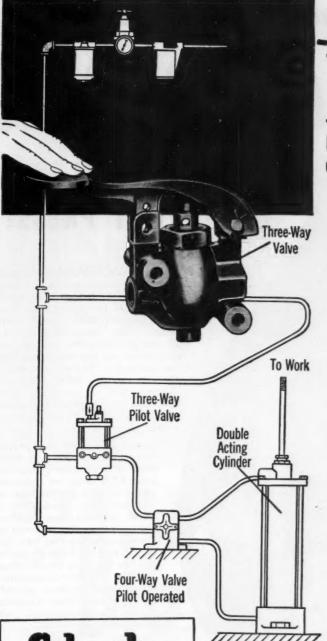
50 West 50th Street, N. Y. 20, N. Y. 100 Bush Street, San Francisco 6, Calif.



SHELL "VPI"

(a volatile corrosion inhibitor)

stops air and maisture from making rust.



-Air Control Startswith Schrader Valves

To use work ejection ... clamping ... and the numerous pneumatic sequence controls that work wonders in the average plant, you need reliable valves.

That's where Schrader Valves come in. Whether your air equipment is actuated by hand, foot, cam or tripper, you'll find a Schrader engineered valve that exactly fits your needs.

With over a hundred different models to choose from ... each functionally designed to cover a broad range of applications ... you'll have no trouble finding just the valve you need—one that is compact, easy to install, simple to maintain.

Each Schrader Valve is individually tested to full pressure rating before it is shipped. That's why you're sure of reliable service from every valve that bears the Schrader name.

Whatever your production scheme, it's likely you use air as a tool. And wherever you use air, there's a chance to make its use more effective with valves you can count on—Schrader Valves.

To see how truly practical Schrader Valves are...how you can't help but benefit from their use, write, describing your compressed air requirements—or fill out the coupon below.

Schrader

products
control the gir

Mail This Coupon Today

Air Cylinders • Operating Valves • Press & Shear Controls • Air Ejection Sets • Blow Guns • Air Line Couplers • Air Hose & Fittings • Hose Reels • Pressure Regulators & Oilers • Air Strainers • Hydraulic Gauges • Uniflare Tube Fittings

Make sure your dies are always



WITH A KRW HYDRAULIC DIE-TRYOUT PRESS!

Rane Tool Co. of Jamestown, N. Y., makes hundreds of different dies for America's leading metal-working companies. Thanks to their KRW 125 ton, 3-cylinder Hydraulic press, Rane knows their dies will work perfectly in the customer's plant. Some Rane dies are small enough to fit in the palm of your hand; others are big babies that take ten men to lift. And all of them are tried out on this KRW press. It's working 95% of every day. And the Rane people tell us it's the most versatile piece of equipment in their shop.

Whether die-making itself is your business, or whether you make dies for your own production use, a KRW die-tryout Hydraulic press will soon pay for itself in time and money saved. With a KRW press in your machine shop you know dies will work in production before they leave the shop. There's a KRW Hydraulic press to meet any metalworking problem. 25 - 150 ton capacities, all self-contained above ground; one, two and three cylinder models; hand operated, air operated or motor driven.

Ask your machinery dealer to quote you or write, wire or phone Dept. 15 for full facts, prices and delivery dates.

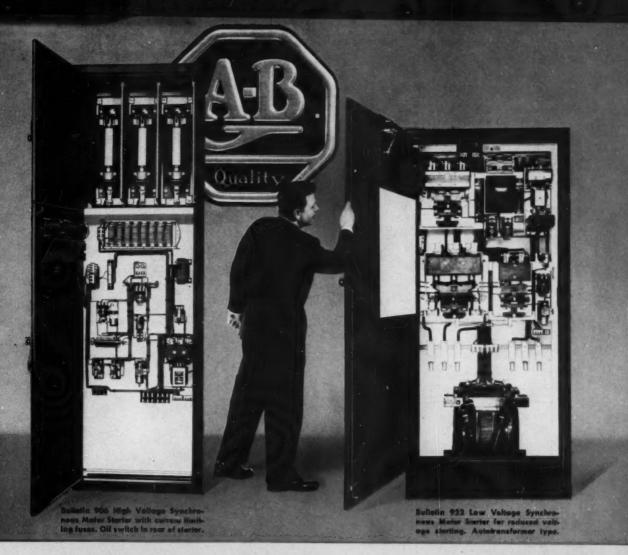


K · R · W I L S O N

Designers and builders of hydraulic presses to meet any metal working problem

21.5 MAIN STREET . BUFFALO 2. N. Y.

410



STARTERS

Bullatin	Type of		208-220v	Maximum 40-550v	Horsepower 2000-2500v	2501-4600
Number	Woloi	Operanon	125	250	700	700
726	Sq. Cage	Automatic	-	600	-	-
740	" "	"	300	600	-	-
741	" "	"	300	600	-	-
746	19 19	"	300	-	700	700
904 906 914	Synchr.	. Manual Automatic	250*	250 700* 250* 700*	900*	90
922	1 11	"	350*	1 700		

(*) At 100% power factor

The motor starters, shown above, are examples

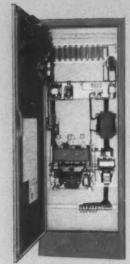
of the many big units in the Allen-Bradley line. Various types of manual or automatic starters for synchronous motors are available...up to 900 hp., 220 to 4600 volts.

High voltage squirrel cage automatic motor starters are listed up to 700 hp., 2000 to 4600 volts. Relays and contactors are time-tested A-B designs, fully protected when specified, by current limiting fuses.

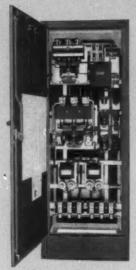
The A-B Handy Catalog is a convenient manual on motor controls . . . large or small. Write for it, today!

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.

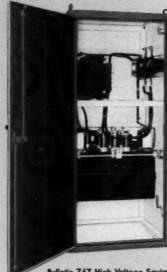




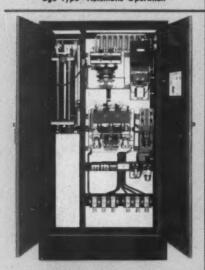
Bulletin 906 Low Voltage Synchronous Motor Starter—Full Voltage Type—Automatic Operation



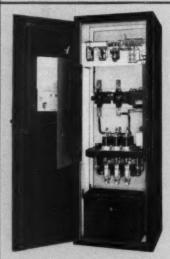
Bulletin 742 Low Voltage Squirrel Cage Motor Starter—Stepless Resistance Type—Automatic



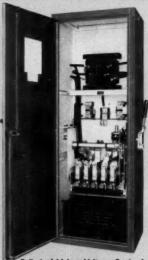
Bulletin 747 High Voltage Squirrel Cage Motor Starter — Autotransformer Type—Automatic Operation



Bulletin 914 Low Voltage Synchronous Motor Starter—Resistance Type—Automatic Operation



Bulletin 726 High Voltage Squirrel Cage Motor Starter—Full Voltage Type—Automatic Operation



Bulletin 646 Low Voltage Squirrel Cage Motor Starter—Autotransformer Type—Manual Operation

Starters for Large High and Low Voltage Motors

The light quality of design and construction, which has made the Aller Stadiety line a feature among motor starters, is built and the starters are the starters and the starters are the starters

The in high starting can be expelled with oil standard accessories such as contestors for controlling auxiliary equipment, making and in trying in a contest limiting fuses, etc. At maximum, rating, most starters have an interryipting consulty of 10

times motor full load current

Standard features of A-B synchronius starters include polarized field frequency relay, automatic resynchronisation thermal overlead relays; exit-of-step relay, and undervoltage protection. Reduced voltage starting is available either with resistor or autotransformer control.

andard features of the big A-B squirrel care mate an others include overload relays. Cur nest smithing force are recommended

ALLEN-BRADLEY



Allen-Predicy Company 1316 S. Second Street Milwaukee 4, Wis.

In "Pushbutton Plant" Farval systems supply automatic lubrication

Not far from Detroit there's a Factory of the Future. Almost automatically, it turns out V-8 engines for a well-known motor car. Uniformity of parts, produced with unfailing precision and high efficiency, is the goal.

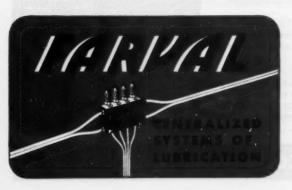
Heart of the manufacturing process is a battery of units, synchronized and conveyorized, that mill, drill, bore, ream and tap the cylinder blocks. Continuous operation of this group of machine tools and protection of their precision work are insured by adequate lubrication—continuous, automatic lubrication with Farval Centralized Systems.

Farval lubricates all bearings while the machines are in operation. Result: No shutdowns to lubricate or replace bearings that might fail due to inadequate oiling. Labor is saved, lubricant is saved, bearing expense is saved, and most important of all, production time is saved.

Farval is the original Dualine system of centralized lubrication for industrial equipment, proved practical in 25 years of service. The Farval valve has only two moving parts—is simple, sure and foolproof, without springs, ball-checks or pinhole ports to cause trouble. Through its full hydraulic operation, the Farval system unfailingly delivers oil or grease to each bearing—as much as you want, exactly measured—as often as desired. Indicators at all bearings show that each valve has functioned.

In or near your city there's a Farval engineer, ready to discuss your lubrication problems and suggest a proper system to meet your particular needs. The Farval Corporation, 3276 East 80th Street, Cleveland 4, Ohio.

Affiliate of The Cleveland Worm and Gear Company, Industrial Worm Gearing. In Canada: Peacock Brothers Limited.





FARVAL-Studies in Centralized Lubrication No. 138



KEYS TO ADEQUATE LUBRICATION — Wherever you see the sign of Farval—the familiar valve manifolds, dual lubricant lines and automatic central pumping station you know a machine is being properly lubricated.

In the machine illustrated, last in the line, you can see an engine block being tapped. A finished block rests on the conveyor at left, center.

Farval manually operated and automatic systems protect millions of industrial bearings.

Are you keeping up with the **Armstrong System of Tool Holders**

Doubtless you are daily using ARMSTRONG TOOL HOLDERS that have been in continuous operation for many years. This is sound practice, for this means added profits without added tool costs. But to become complacent, so satisfied that you forget your ARMSTRONG TOOL HOLDERS, is unwise. The "Armstrong System" is a growing thing, with new types and sizes of ARMSTRONG TOOL HOLD-ERS constantly being developed to more effectively meet new machining conditions, or to take advantage of newly developed cutting materials.

With modern ARMSTRONG TOOL HOLDERS

for each operation, you can greatly increase speeds and feeds. You can lower machining cost and further increase profits.

If you haven't kept up with the "Armstrong System" write for an ARMSTRONG Catalog and check to see that you are using the most efficient ARMSTRONG TOOL HOLDER for each operation on all lathes, planers, slotters and shapers.

WRITE FOR CATALOG





ARMSTRONG BROS. TOOL CO. 5213 W. ARMSTRONG AVENUE CHICAGO 30. ILL

"The Tool Holder People



Production rate up 1100% when switch is made to

CARD TAPS

The job was tapping soft steel parts made from SAE 1010 steel. The holes were extruded and tapped 3/8-18 NPT. But with the taps being used a midwest metal fabricator was getting only 200 to 300 tapped holes, which was considered pretty good at the time.

Then somebody said he really ought to be getting more, so the shop superintendent decided to investigate. He called in a Card representative and talked over the matter with him. Solution: A Card High Speed Interrupted Pipe Tap was put on the job. Result: 4,267 tapped holes — or an increase in production of more than 1100%.

Meet him. Your Card representative, backed by Card's

SEE YOUR CARD DISTRIBUTOR FOR PROMPT DELIVERIES AND HELPFUL SERVICE engineering staff is always available for aid on any problem. S. W. CARD MANUFACTURING COMPANY, Mansfield, Massachusetts. Division of Union Twist Drill Company.



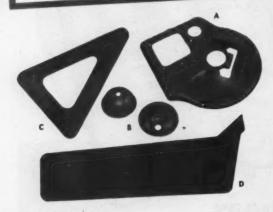
TAPS

Production Proved For Lasting Accuracy

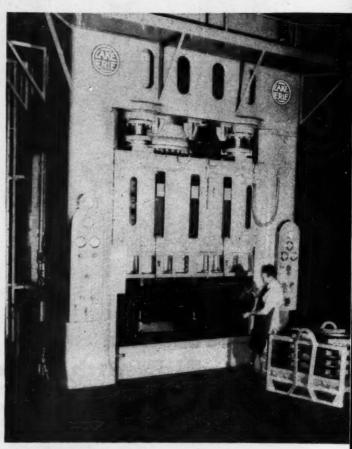
Also makers of DIES + SCREW PLATES + DIE STOCKS
TAP WRENCHES

CATERPILLAR TRACTOR CO. demonstrates the wide applications of Lake Erie Hydraulic Presses

A good example of the great variety of money-saving opportunities for hydraulic presses in the modern metal working plant.



TYPICAL PIECES FORMED ON PRESSES. (A) Steel cover 35" long. 26" wide and ½" thick is blanked and drawn in a single operation with 1200 tons pressure. Cover is pierced, trimmed and restruck on smaller hydraulic press after blanking and drawing. (B) King bolt liners formed out of .134" hard brass are 8" in diameter. Pieces are blanked, drawn and coined on the 500 ton Lake Erie press. (C) Earth-moving bulldozer lifting crank 24"x24"x12" outside, 12"x12"x10" inside x1" thick blanked in a single operation. (D) Blank for earth-moving bulldozer end plate is 10" wide at one end, 12" at other, 54" long and %" thick.

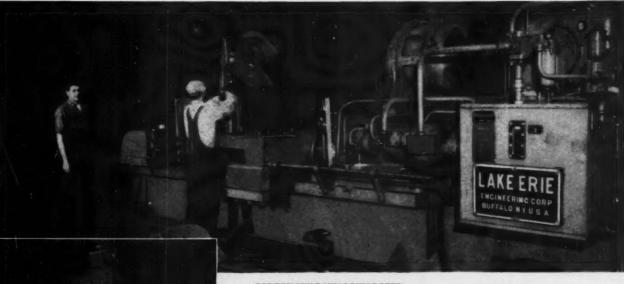


2000 TON DOUBLE ACTION PRESS.

This press has a 500 ton hydro-pneumatic die cushion, bed size of 96"x96" and daylight opening of 60". It is used generally for forming large pieces requiring high tonnage, but is also used for heavy blanking jobs.

750 TON SINGLE ACTION PRESS left —500 TON DOUBLE ACTION right.

These presses are used for a wide variety of forming operations including blanking, bending, drawing, piercing and coining. The pieces illustrated at left above are a few examples of the work done on the three presses shown on this page.



500 TON HYDRAULIC BULLDOZER.

This widely-used horizontal press is shown hot forming draft frame reinforcements. Pieces are \(\frac{8}{3} \) thick, 30" wide and approximately 4' long before bending. A pressure of 400 tons is used.

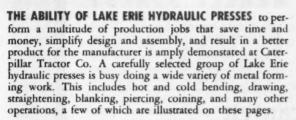
200 TON TRAVELLING HEAD STRAIGHTENING PRESS.

A versatile, highly accurate press that is very much in demand. Used to straighten all types of weldments such as bulldozer blades and other large weldments, some of which appear in lower right corner of photo.





The piece shown above is another example of hydraulic bulldozer work. It illustrates draft frame bottom plates which are hot formed from \(\frac{1}{2} \) thick stock 7\(\frac{1}{2} \) long before bending. Draft frame reinforcement also formed on hydraulic bulldozer is shown at left.



It is hard to conceive of a metalworking plant today that wouldn't benefit immensely through the use of one or more of these hydraulic presses—possibly a hydraulic bulldozer... or a straightening press... or a single action press with die cushion... or some other type or combination of presses. Why not discuss this possibility with our engineers? We have developed more than 3,500 designs for hydraulic presses to meet practically all needs. We serve the leaders throughout industry with complete satisfaction. We can do it for you. Write or phone today.



LAKE ERIE ENGINEERING CORP.

MANUFACTURERS OF HYDRAULIC PRESSES AND SPECIAL MACHINERY General Offices and Plant

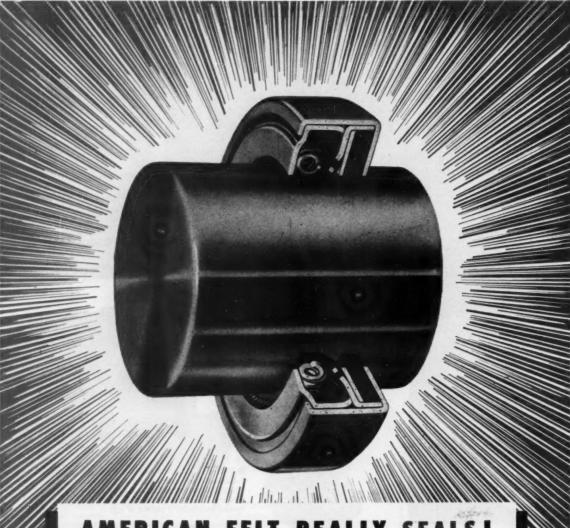
170 Woodward Avenue, Buffalo 17, New York

DISTRICT OFFICES IN NEW YORK, CHICAGO and DETROIT
Representatives in Other Principal Cities in the United States and Foreign Countries
Manufactured in Canada by: Canada Iron Foundries Limited

LAKE ERIE HYDRAULIC PRESSES are available in any size . . . standard, modified and special designs—horizontal and vertical types—for Metal Working—Plastics Molding—Forging—Metal Extrusion—Processing—Vulcanizing—Laminating—Stereotype Molding—Die Casting—Briquetting—Baling—Special Purpose.

Designers and builders of the most complete line of Hydraulic Presses for the manufacturing industries

MACHINERY, November, 1952-51



AMERICAN FELT REALLY SEALS!

Shown above is an OilFoil seal, consisting of two layers of felt, bonded with two septums of Hycar, the synthetic rubberlike substance that is impervious to and unaffected by oils, greases, and the hydrocarbons used in hydraulic systems. Such washers can have one, two, or three sep-

tums, to keep lubricants in and seal out water, dirt, gases and retain pressures. If there is no lubricant in the enclosure, the felt can be impregnated with oil or grease, to pro-

vide lifetime bearing lubrication. OilFoil seals are supplied cut to exact dimensions, ready for assembly, and usually require no attention between major overhauls. For more information, write for Data Sheet No. 11, "Felt Seals, Their Design and Application." Free. American Felt's En-

gineering & Research Department will gladly collaborate with you on sealing and lubrication problems, and on any other matters concerned with felt.

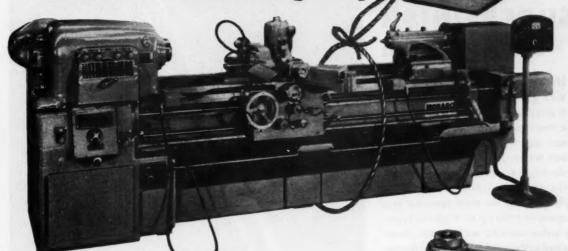


GENERAL OFFICES: 68 GLENVILLE ROAD, GLENVILLE, CONN.

SALES OFFICES: New York, Boston, Chicago, Detroit, Cleveland, Rochester, Philadelphia, St. Louis, Atlanta, Dallas, San Francisco, Los Angeles, Portland, Seattle, San Diego, Montreal.—PLANTS: Glenville, Conn.; Franklin, Mass.; Newburgh, N. Y.; Detroit, Mich.; Westerly, R. I.—ENGINEERING AND RESEARCH LABORATORIES: Glenville, Conn.

COST

-after 276 working days



IT WROTE OFF ITS COST IN 101/2 MONTHS!

This report comes from a well-known machine tool manufacturer (not us!). We can show you many similar ones from all kinds of plants. They all add up to one incontrovertible fact—Monarch Air-Gage Tracer controlled, fully automatic turning, with its single running tool, delivers output at top efficiency. Why not? Look how many ways it saves! In turning time. In setup time. In tooling time and costs. In subsequent grinding. It's true of short runs as well as long ones.

The Monarch Air-Gage Tracer is known everywhere for its superb accuracy of duplication. The swiveling type used here adds to this accuracy an amazing versatility. Apply it to our 20 x 72 Series 60 Lathe and add the Autocycle Control as above, and you have the shop man's dream come true—the ultimate in versatility plus fully automatic operation.

This manufacturer, after only brief experience with his Series 60, quickly added a 20 x 168 Model M Heavy Duty Lathe with similar equipment. Together, using round templates, these machines are delivering automatic output of over 600 jobs!

The Air-Gage Tracer is right! Its performance is right! Why don't you write—for complete information? Request Booklet #2606 and mention your specific requirements....

The Monarch Machine Tool Company, Sidney, Ohio.

HERE'S HOW!

... And by the user's own figures! This lathe was bought to turn 20 to 25 jobs. It proved so versatile that, with the larger Model M, it's now turning 600. Time savings vary from job to job, but here's a sample. One difficult work piece used to require 3½ hours' turning. It's turned now—in lots of 24—in 10 min. per piece. Each lot in only slightly more time than it used to take for each piece!



do you have OIL SEAL TROUBLES?



SUPERFINISH can solve them!

Here's a typical case where a shaft with ground surfaces was driven at a speed of 1750 r.p.m. The oil seals created enough heat to burn the shaft and stop the motor. To make matters worse, it was found that twice the original speed was necessary. So, the oil seal surfaces were Superfinished, and the shaft operated at a speed of 3500 r.p.m. With the Superfinished surfaces, no heat was developed at this higher speed. No further trouble was encountered.

Superfinishing is a quick, simple and inexpensive process. Oil seal surfaces are but one of the many applications where it can save you money. Not only can it eliminate trouble, but often it can help you reduce manufacturing costs. Gisholt engineers can advise you regarding its applications.

> Write now for the booklet "Wear and Surface Finish."

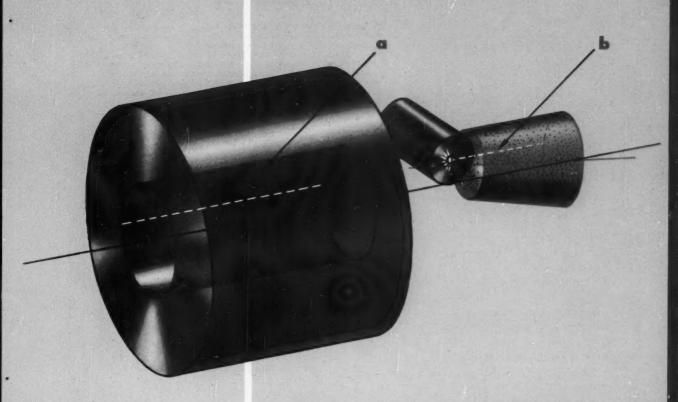
Superfinished)

Superfinished



represents the collec-tive experience of specialists in the ma-

TURRET LATHES . AUTOMATIC LATHES . SUPERFINISHERS . BALANCERS . SPECIAL MACHINES

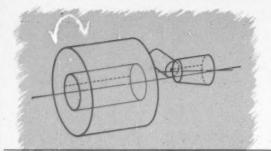


bryant internal grinding GRINDING a straight hole on an internal grinder is normally done with a straight (cylindrical) wheel. It is sometimes desirable to turn the wheelhead and dress the wheel to a taper in order to use a more rigid projection. However, this setup presents some serious obstacles which cannot be overcome unless they are clearly understood. In order to grind a straight hole the various elements of the machine must be in perfect alignment. The degree of alignment will be determined by the accuracy required on the finished part. A machine may be lined up sufficiently to produce holes within tolerance when grinding with a straight wheel, but if the wheel is turned and dressed to a taper, the alignment problem is magnified to such an extent that it may be impossible to produce holes within the same tolerance.

The center lines of the wheel, work and diamond must be in a common plane so that the wheel contacts the work at line "a". If the tapered wheel contacts the work above or below line "a" the wheel will touch only at its largest diameter and, as the wheel reverses (at the left end of the hole), it will transfer its taper to the work resulting in a tight hole at the back. Turning the workhead or changing the length of traverse cannot overcome this error. Further, because of poor contact, wheel wear will be excessive and finish poor.

If the diamond is set either above or below line "b" (which is a continuation of "a") the wheel will be dressed to a curve (hyperbola) and even if the wheel contacts the work at line "a" it will be only a point contact. Again, the wheel form will be transferred to the work at the point of reversal, wheel wear will be excessive and finish poor. The proper setup calls for perfection in setting the center height of wheel and work to zero and setting the diamond on dead center of the wheel.

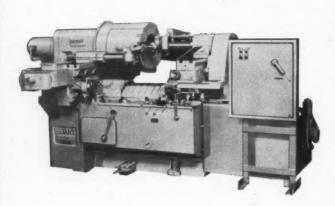
Bryant Chucking Grinder Co. Springfield, Vermont



bryant internal grinding

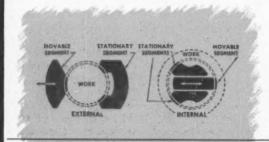
Accurate alignment of various machine elements is a basic consideration on even the simplest machine tool. Industry's demand for increased production and accuracy makes the alignment problem more critical than ever before. Bryant machines are designed so that they may be aligned, and this alignment may be maintained throughout the life of the grinder. Alignment and its effect on precision hole grinding is discussed on the preceding page.

The Bryant 1126 Precision Hole Grinder



This heavy-duty, semiautomatic machine, with hydraulic controls, has 26" swing and will grind holes with a maximum depth of 12". Although designed for large, heavy work, it will grind holes as small as 1" dia. The extremely rugged bed provides the strength and rigidity necessary for vibrationless operation. The workhead has two positions, one for grinding, and a forward position for ease in loading and checking large work. The wheelhead is adjustable to grind up to 15° included angle. Workhead and wheelhead slides are anti-friction to provide extremely accurate grinding and sensitive control. Write for illustrated folder.

Bryant Chucking Grinder Co., Springfield, Vermont, U. S. A.



bryant thread gaging

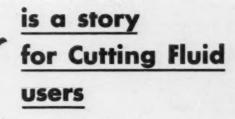
Bryant gages are built on the principle of an "expanding" master plug for checking internal parts, or a "contracting" master ring for checking internal threads. A dial indicator gives a reading of P.D. which includes variation in thread form and lead. This is an accurate indication of assembleability.

The Bryant Internal Recess & Diameter Gage



This is basically a split plug gage for inspecting internal recesses in parts such as "O" rings, and snap rings. It is equally effective for bench inspection or for gaging internal recesses and diameters on parts still held in the machine, or in large work that is difficult to move to the inspection department. One gage, with various bore or recess type segments, will check from 5/16" to 5" in diameter. Write for catalog describing full line of Bryant Thread Gages.

"The Ass in the Lion's Skin"



. . . with credit to Aesop, the Fable-Maker

An Ass dressed himself up in a Lion's Skin and ran about scaring the daylights out of the other farm animals. Then he tried to frighten his owner, the farmer. That was his downfall. The farmer soundly beat the stupid ass with a big stick, teaching him that he couldn't fool any sensible person by parading around as something he wasn't.

The Moral:

Different types of cutting fluids have their respective places in machining. Dressing a coolant up in a "Lion's Skin" doesn't change its capabilities. For example, if you have a difficult broaching job on a soft, tough steel more than a "coolant" is needed. You need the high antiweld properties, the high lubricity and the superior temperature regulating qualities of a

product like Stuart's ThredKut 99.

Stuart offers you a combination of timetested products and wide experience in their application. You gain from this fewer rejects, longer tool life and greater production—often with fewer different cutting fluids in your plant. Ask to have a Stuart Representative demonstrate how he can save you time, money and material.

More Than a "Coolant" is Needed

D.A. Stuart Oil Co.

71ME-TESTED CUTTING FLUIDS AND LUBRICANTS 2739 S. Troy St., Chicago 23, III.

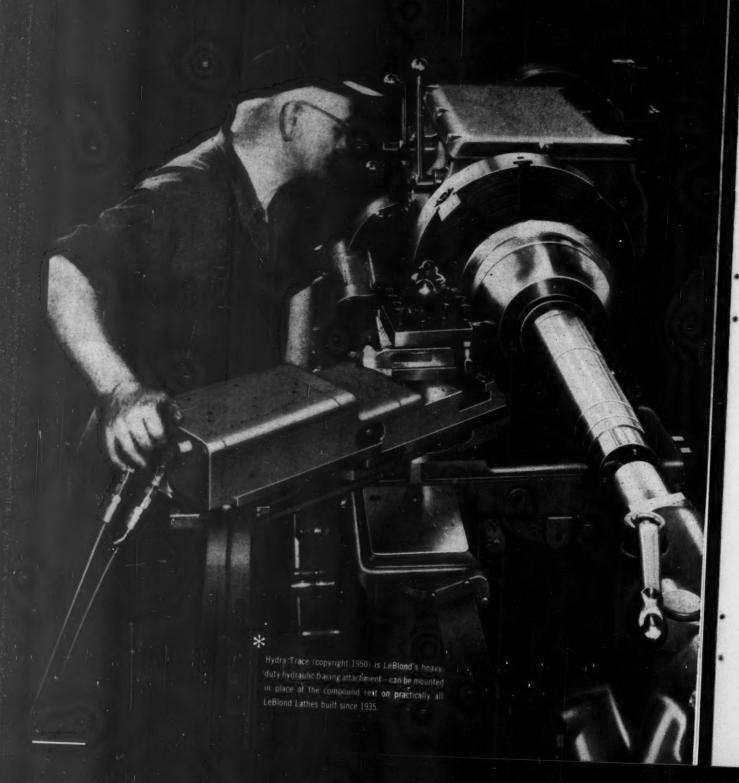
SEND	FOR	BOOKLET	entitled	More	Than	"Coolent"	fa	Nooded

CLIP TO YOUR COMPANY LETTERHEAD AND MAIL to D. A. Stuori Oil Co., Ltd., 2739 S. Troy St., Chicago 23, III.

Your Name

Title

"sweet is the name for HYDRA-TRACE"





turning time cut 60% on contoured 3-step shaft

Centrifugal machines made by The Western States Machine Co. of Hamilton, Ohio are used in all corners of the world for the processing of sugar. Three years ago, this company had to speed up machining methods.

One important part, a contoured 3-step shaftcalled a "ball and quill"-carries the thrust of the basket as it spins at 1800 rpm. The ball allows the basket to shift slightly, compensating for unbalanced loads. This part was first produced in the usual manner, which included turning the contour with a radius attachment, followed by tedious file finishing.

Then, on the recommendation of LeBlond's Cincinnati Distributor, E. A. Kinsey Co., a Hydra-Trace unit was installed on a 16" LeBlond Heavy Duty Lathe. The result was "sweet"-turning time cut 60%!

Sweet, too, were the other benefits of Hydra-Trace. No need for highly-skilled operators. Flat templates, made quickly, stored easily. Short set-up time. Heavy-duty capacity. Many more.

See how you can reduce to hours and minutes tracing jobs formerly measured in weeks and days. Ask your distributor or write us direct for the rest of the story on Hydra-Trace.

CHINE TOOL COMPANY, CINCINNATI

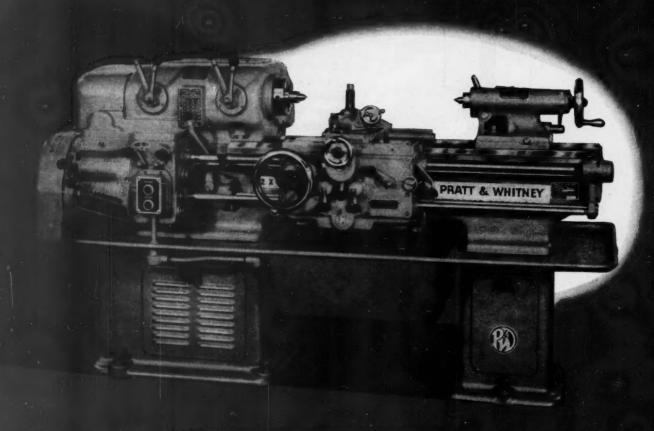
Ask for bulletin HT2D for complete details on LeBlond Hydra-Trace

turned faster by



PRATT & WHITNEY

Lathes



DIVISION NILES-BEMENT-POND COMPANY WEST HARTFORD 1, CONNECTICUT, U.S.A.

First Choice (1) for Accuracy



EVERY DETAIL

FLAME-HARDENED AND PRECISION-GROUND BED WAYS are constructed of specially selected materials processed by exclusive P&W methods. Automatic lubrication from a reservoir in the carriage is provided. The result is great resistance to wear, permanent stability and a high initial accuracy indefinitely retained.

> SUPER-PRECISION SPINDLE is mounted at the front end in two



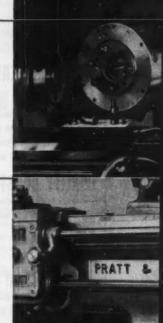
preloaded precision bearings and at the rear end in anti-friction type needle bearings.



HEADSTOCK GEARS of hardened and ground alloy steel are accurate in tooth form and spacing to "tenths". Multiple splined gear shafts are mounted throughout on anti-friction bearings. 18 spindle speeds in smooth geometrical progression are provided.



CAM-LOCK SPINDLE NOSE is recognized by the American Standards Association as the most rigid and permanently accurate means of holding chucks and face plates to the spindle. Operation is safe and convenient; there is no danger of a chuck's freezing in place or being thrown off in high speed operation.



SEPARATE LEAD SCREW AND FEED ROD preserve the original accuracy of the machine. The lead screw is used only during actual thread cutting, and in ordinary turning operations the carriage is moved entirely by the splined feed rod. Wear that might impair precision is reduced

LARGE DIRECT-READING DIALS contribute to speed, accuracy and convenience in operation. The easy-toread graduations give work diameter reductions in thousandths of an inch on the cross slide and on the compound rest.



CONVENIENT **OPERATION**

in the Modern Tool Room

PRATT & WHITNEY



ABRASIVE No. 12 TOOLROOM SURFACE GRINDER

FAST

— all hand feeds — no stops, gears, or automatic feeds to adjust or fuss with.

BIG CAPACITY

— up to 15" long x 10" wide x 12" high.

MINIMUM VIBRATION

— built-in motor is integral part of grinding head.

SIMPLE DESIGN

— hand feeds eliminate many moving parts.

EASY OPERATION

— large hand wheels located out front at right height for easy, convenient operation.

PRECISION VERTICAL ADJUSTMENT

— rapid and sensitive for quick, accurate control of depth of cut. Elevating handwheel may be mounted on either right or left side of wheel head.

QUALITY CONSTRUCTION

 ways fully protected against grinding dust to reduce wear and prolong grinder life.

HIGH QUALITY WORKMANSHIP

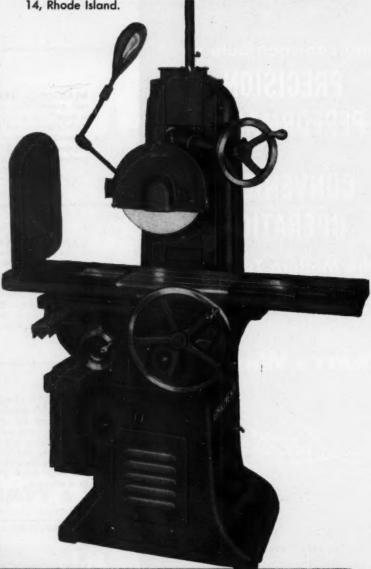
— ways and wheel slide hand scraped so spindle is square with ways within .0005".

ABRASIVE

MEEURACK BOOSTS PRODUCTION

Thousands in use throughout the world!

Why not give your toolmakers the Abrasive No. 1½ — favorite toolroom surface grinder in big and small shops throughout the world. Write for illustrated catalog. Abrasive Machine Tool Company, 12 Dunellen Road, East Providence 14, Rhode Island.



Abrasive Quality is Reflected in the Finish of Your Product



BOEING SPEEDS PRODUCTION

with "The right file for the job"

The vast military program has made "Faster production" a cry in every contributing industry... with thousands of tools and machines claiming the ability to respond. In few manual operations can speed and efficiency be more noticeably increased than in filing. And where Nicholson Special Purpose Files are recommended and used, the results are usually outstanding.

Here "Special Purpose" means special design for special facility in working on specific jobs and materials. Practical file engineering and exhaustive laboratory and shop tests have eliminated all "ifs" and "buts."

Nicholson is pre-eminent in file designing and manufacturing — exclusively. You'll do well in letting a technically-minded Nicholson industrial distributor or field engineer help your parts-production and assembly-line superintendents in assigning the right files to their difficult, unusual and mass-production filing jobs.

Sold through Industrial Distributors

FREE TECHNICAL BULLETIN on "TEN SPECIAL FILE TYPES." Also 48-page handbook, "FILE FILOSOPHY," on kinds, use and care of files. Write to the factory.



NICHOLSON FILE CO. • 18 ACORN STREET • PROVIDENCE 1, RHODE ISLAND



NICHOLSON FILES FOR IVERY PURPOSE



light weight carries the load

Torrington Needle Bearings are light in weight, compact. They effect weight and space savings in housings and other related parts—without sacrificing strength or efficiency.

The reason is simple: Needle Bearings have greater rated radial load capacity in relation to size than any other type of anti-friction bearings.

So if your design needs a bearing light in weight to handle heavy loads, investigate the advantages of Torrington Needle Bearings. Our engineers will welcome the opportunity to assist you.

THE TORRINGTON COMPANY

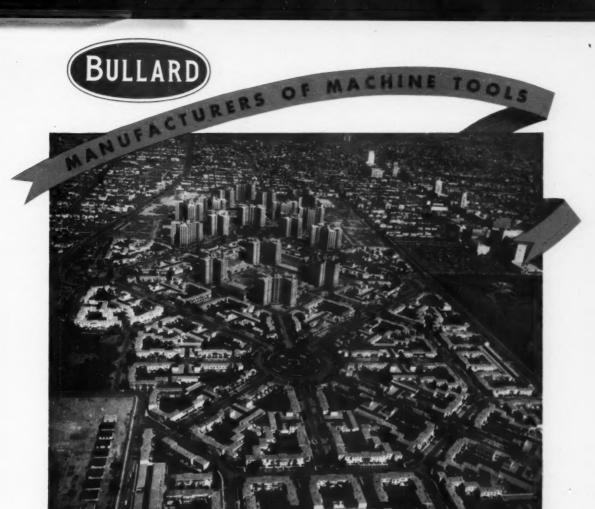
Torrington, Conn. South Bend 21, Ind.

District Offices and Distributors in Principal Cities of United States and Canada



TORRINGTON NEEDLE BEARINGS

Needle . Spherical Roller . Tapered Roller . Straight Roller . Ball . Needle Rollers



"Park La Brea", Metropolitan Insurance Company housing project - Los Angeles, California

Los Angeles Times Photo

The Invisible Background of Industrial Progress

American Initiative — American Free Enterprise —
state and municipal planning, through new and modern housing
developments are raising the standards of the American Way of Life for a large part
of our one-hundred-and-sixty-million population. Illustrated here is
"Park La Brea", a Metropolitan Insurance Company housing project in Los Angeles,
California. This is typical of today's Modern City planning, incorporating
up-to-the-minute home facilities including auto parking and recreational park areas.
These projects encompass many phases and many industries for the production of
construction equipment, materials, inbuilt equipment such as elevators, heating and
air conditioning units and the wide variety of household appliances. In
The Invisible Background of Industrial Progress are the builders of

★ Modern Machine Tools who provide basic manufacturing equipment to the infinite numbers of industries required to complete these huge developments. Bullard plays a singular part in American Progress and is proud of its contribution to the American Way of Life.

THE BULLARD COMPANY BRIDGEPORT 2 CONNECTION

* For greater manufacturing economy REFER to next page BULLARD MACHINE TOOLS

FOR GREATER MANUFACTURING ECONOMY



From the time of the inception of the Mult-Au-Matic back in 1914 these machines in customers' plants have probably machined the largest variety of work of any machine tool. Illustrated herewith are only a few of many hundreds of Mult-Au-Matic jobs. The machine's versatility suits it for nearly any type and shape of work where the operations call for boring, turning, facing, drilling, reaming and threading.

Motor manufacturing which includes pleasure ears, trucks, tractors, mechanical farm equipment and airplane engines is the largest user of these automatic multiple spindle machines. However other manufacturers contributing to the mining, shipbuilding, hydro-electric, ore, railroading, oil, bridge construction industries, scientific developments and modern housing projects have found the economy of Mult-Au-Matic production a large factor in the marketing of their products. Wherever automatic multiple spindle manufacturing can be efficiently used there is a place for Mult-Au-Matics with their attendant savings in manufacturing costs. Bullard engineers are ready to assist in applying Mult-Au-Matic efficiency to your particular manufacturing problems. Let us make a study of your production methods.

For Manufacturing Economy use Mult-Au-Matics. Built in 8-, 12-, 16-, and 34-inch sizes with 4, 6, 8, 12, or 16 spindles according to the specific model.



THE BULLARD COMPANY

BRIDGEPORT 2, CONNECTICUT

his. of hour treatment

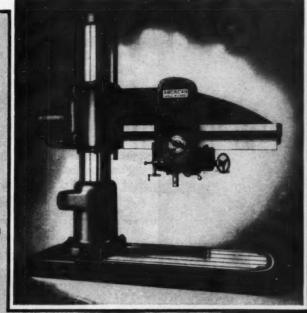
... required to produce the ultimate in radial drill spindles

"AMERICAN" Radial Drill Spindles are made of nitralloy. 20 hours of heat treatment from rough to finish, then 72 hours of nitriding are required to produce the wear-resistant spindles used in these radials.

Both the spindles and sleeves are nitrided to 110 degrees scleroscope. This is harder than some grades of cemented carbide. The sleeve is finish honed and the spindle ground and then <u>diamond lapped</u> to a sliding fit in the sleeve. Because of the lack of affinity between these two hard surfaces the clearance between them may be reduced to the very minimum, which in this case is .00025".

This results in the greatest possible stability, resulting in an ideal construction especially for accurate boring operations, which demand a high degree of smoothness and rigidity of the spindle.

This is but one of the super features that make the "AMERICAN" Hole Wizard an outstanding investment.



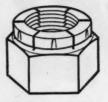


THE AMERICAN TOOL WORKS CO.

Lather and Radial Day

Cincinnati, Ohio U.S.A.





FLEXLOC Self-Lacking Hut

Just what are these Flexloc nuts?

"They're nuts that lock and stay put on a bolt. Once you install them, you can forget them. They sure save a lot of time in maintenance. Let me show you just what I mean. This shuttle assembly is fastened together with Flexloc Self-Locking Nuts. We haven't had to put a wrench on it since we installed it."

When nuts work loose, you're in real trouble. Machinery is often damaged and stopped. Production suffers, deliveries lag, and you lose money. But there's a sure way to keep nuts where they belong. Specify and install FLEXLOC Self-Locking Nuts.

FLEXLOC locknuts have higher tensile strength than most other locknuts. They're not affected by temperatures to 550°F. And because their torque is controlled within such narrow limits, they have been used successfully on plastic studs.

Increased capacity now enables us to make quantity shipments of FLEXLOC locknuts in a wide range of sizes. Write for literature, and samples. STANDARD PRESSED STEEL Co., Jenkintown 19, Pa.

FLEXLOC LOCKNUT DIVISION



JENKINTOWN, PENNSYLVANIA

STOP THIS

Get rid of these marks. They mean "leakers", these tell-tale trails left when the chasers release at the end of the cut on taper pipe threads.

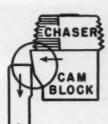
Namco Vers-O-Tools now offer you an easy, economical cure—our exclusive development—

EXPANDING ACTION

which entirely eliminates this pipe thread defect caused by less precise threading heads.

Not only does this improved Namco design materially reduce costs—it enables you to attain high precision and smoothness on the better class of work previously thought to require thread grinding or rolling.





Taper on cam block permits chaser to expand gradually just before quick opening — not snap off too quickly, leaving a telltale mark.

ACCURATE, SMOOTH
PRESSURE TIGHT PIPE THREADS
EVERY TIME

These new expanding-action Vers-O-Tools are available in both revolving and non-revolving styles, and are used with both Namco circular or adjustable blade chasers.

Get full details now—in complete new catalog covering Vers-O-Tool heads and collapsible taps. Ask for DT-52.



The NATIONAL ACME CO.

170 EAST 131st STREET . CLEVELAND 8, OHIO

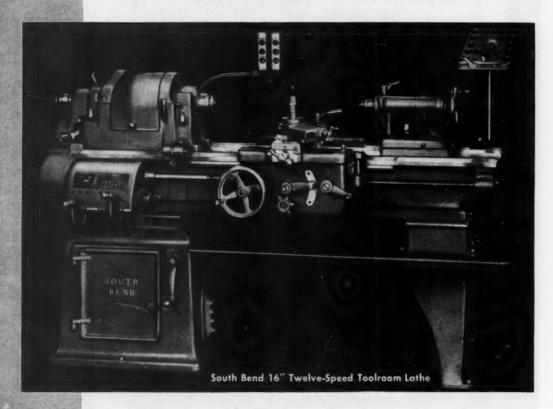
Acme-Gridley Bar and Chucking Automatics: 1-4-5 and 8 Spindle - Hydraulic Thread Rolling Machines - Automatic Threading Dies and Taps - The Chronolog - Limit, Moter Starter and Control Station Switches - Solenoids Centrifuges - Contract Manufacturing

Cuts Machining Time

The wide range of spindle speeds on this new lathe cuts machining time because the operator quickly selects the right speed for each operation. Pushbutton control provides a fast change from any high speed to the corresponding low speed. This versatility is further increased by 48 choices of longitudinal

SOUTH BEND 12 SPEED LATHE

and cross feeds which insure maximum efficiency on every job. Also, you will find that its accuracy and ease of operation make your tough jobs easy. Send the coupon for complete information.



SPECIFICATIONS

Spindle Speeds — 12. Direct drive: high range 300, 550, 945; low range 150, 278, 475. Back gear drive: high range 32, 70, 118; low range 20, 33, 60.

Spindle Bore - 1%".

Swing over bed and saddle wings - 1614".

Swing over saddle cross slide - 9%".

Distance between centers — 33¼", 45¼", 57¼", 81¼", 105¼".

Collet Capacity — 1" maximum.

Longitudinal Feeds -- 48 R.H. or L.H., .0015" to .0841".

Cross Feeds -- 48, .0006" to .0315".

Thread Pitches — 48, 4 to 224 per inch.

	9" and 10"	Ploops IATHES	1/2 and 1' Colled TURRET LATHES		
Nome.	BENCH LATHES	L FLOOR LATHES		LI DRILL PRESSES	L_I BENCH SHAPER
Street	11 11 11	City & Ste	ile.		South



delivers high production-low cost carbide planing!

Here's high production — low cost carbide planing at the Beloit Iron Works, Beloit, Wis.

This GRAY OPENSIDE PLANER CUB is running 300' per minute, day in — day out, carbide planing packing strip holders for suction

rolls of paper making machinery.

Planer jobs don't grow old on a GRAY!

Ever see a planer running wide open, day after day at 300' per minute? That's the pace of a new GRAY — the pace that makes your old planer look really old.

Why should you be interested?

Because a GRAY CUB is not only an economical initial investment — it also insures substantial savings in time and money thru its high speed, accurate production ability.

Write today—get the story on GRAY
HIGHLOW COST PRODUCTION

The G.A. GRAY Company

planers * milling planers planer type milling machines horizental baring machines

QUICK!

CINCINNATI 7, ONIO, U. S. A.

SOLD IN CANADA BY UPTON, BRADEEN AND JAMES, LTD. . SOLD IN LATIN AMERICA BY MACHINE AFFILIATES

MACHINERY, November, 1952-71

HYDRATROL LATHES

LARGE HOLLOW SPINDLE TYPE

Check These 3 Points of ...

Jersatility

- Machine long work chucked through spindle.
- 2 Machine work between centers.
- 3 Also built with beds and carriages on each end of headstock for machining both ends of a shaft at one time.

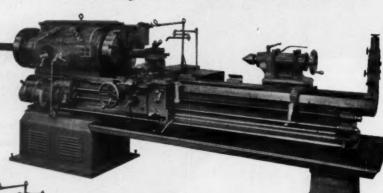
Both Illustrations Show the 18" Hollow Spindle 7%" Hole

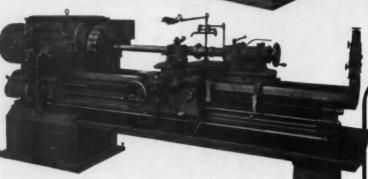
SIZES 18" TO 36"

Small - 18" & 20" up to 7%"

Medium - 25" up to 12" Hole Large - 32" & 36" up to 16%"

Hole (Standard Type Lathes 16"-36")





For Faster Production,

Better Work, Lower Costs!

IMPORTANT FEATURES

Timken Bearing Spindles.

Hydraulic clutches for forward and reverse, controlled from apron or headstock.

Hydraulic brake for close position control.

Hydraulic clutches self-compensating. No adjustment and full power capacity at all times.

LEHMANN MACHINE COMPANY

CHOUTEAU AT GRAND . SAINT LOUIS 3, MISSOURI



MACHINERY, November, 1952-73

Now!...a Wider Range! STANDARD DIAL BORE GAGES

for Positive, Direct, Precision Measurement

*Range of No. 6 Gage can be extended to 16" with special extensions.

STANDARD Dial Bore Gages are now available in eight sizes. As a group they cover a range from ¼" to 16".

They bring high precision right to the workpiece . . . in the machine or at the bench . . . and without auxiliary apparatus.

8 SIZES for all bores from 1/4" to 16"

Extensions furnished to give complete range shown for each size (except No. 00).

No. 3

11/2" to 25/22"

Repeat consistently. Two centralizing plungers on sizes 0 through 6 keep line of measurement through center of bore at all times. Eliminates questionable decisions; minimizes unnecessary rejects; saves time and money.



In addition to above, special gages available for out-of-ordinary applications.

NEW!

3/4" 10 5/0

1/4" 10 3/6"

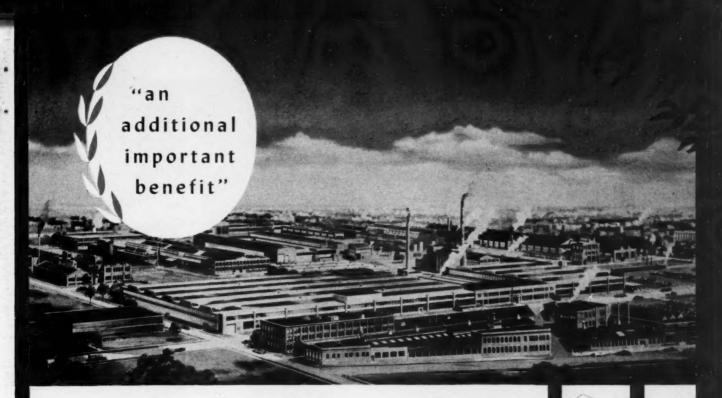
The No. 00 Gage with Centering-size Discs for checking bores ¼" to ¾" with tolerances up to .005"

**Regularly supplied with a centering-size disc made for dimension specified by user. Discs of other sizes may be readily interchanged. If set of discs is desired, covering complete range of ½" to ¾", write for information.

Patent Applied For

WRITE FOR DETAILED INFORMATION

STANDARD GAGE CO., Inc., Poughkeepsie, N.Y.



from a Machinery Replacement Program

"For a good many years Chain Belt Company has followed a fairly good and sound replacement policy. The procedure has been as follows: As soon as a new machine is received and installed, our Plant Engineering Department places a numbered tag on the machine. At the same time an office record is started in a card file using the same number as the tag placed on the machine. This record contains all pertinent information, such as price, year, serial number, model, etc., including repair parts and repair costs against the machine. With this record available, one qualified person reviews this at least twice a year with the department foreman or superintendent, and when the machine is found to be uneconomical to operate, it is either rebuilt or replaced by a new machine.

"For the past few years we have been using the MAPI Formula as a guide to very good advantage. It reveals when a machine or piece of equipment should be replaced. In practice the above policy attracts and keeps good operators on the machines which, in turn, reduces spoilage of parts to a minimum. That's an additional important benefit.

"There is no doubt that the MAPI Formula has helped us make better decisions on our machinery replacements."

L. H. BOSNIAN

Consulting Engineer of Manufacturing Chain Belt Company of Milwaukee

ROCKFORD

INSERT

GROUP



With the traveling ram positioned at one end of the table a crane can lower heavy work into place then the ram can be placed, wherever required, over the work.

The ram rolls on four ball bearing equipped wheels and is easily moved into position by means of a hand wheel

The table is equipped with a "V" slide on which are mounted spring loaded centers and checking rolls. The bed is a welded structure 11 feet long, however, the length can be made to suit a customer's requirements. Length of stroke 6". Longer strokes available to meet individual needs. Power requirements are a 3 h.p. motor.

Send for Bulletin No. 9.6



Anderson Indicator Takes
Guesswork Out
of Straightening

It tells the Operator

- . The exact amount of runout.
- 2. Where to stop the shaft and do straight-
- 3. During the pressure operation, it indicates how much shaft is being bent.
- 4. As soon as pressure is released it shows result of first straightening "try" and gives a guide for the next operation.

THAOS BY

ROCKFORD... MACHINE TOOL SHOPPING CENTER



Heres



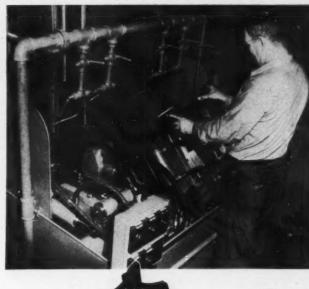
the American WAY

SIMPLE LOADING plus AUTOMATIC CLAMP-ING gives the manufacturer of these connecting rods and caps BALANCED PRODUCTION at the rate of 300 complete assemblies per hour.

The installation, engineered the American-way, consists of a Standard American 10-ton, 42-inch stroke vertical duplex hydraulic broaching machine and two, two-station fixtures mounted on completely automatic tilting-type work tables. Fixtures are interchangeable. One station on each fixture holds a rod part, the other a cap. The operator simply PLACES a rod and a cap on the first fixture . . . then pushes the control buttons. The parts are CLAMPED AUTOMATICALLY while the table tilts down and then broached. While one assembly is broached the operator loads the other fixture.

AMERICAN CAN HELP YOU SOLVE YOUR PRODUCTION PROBLEMS

Just as American has helped thousands of other manufacturers during the past twenty-five years, they can help YOU solve your production problems. For the answer to your problems send a part-print or sample and hourly requirements. Address Dept. M.





WRITE TODAY for your copy of American's Circular No. 300 on American Vertical Hydraulic Surface Broaching Machines,

AMERICAN BROACH & MACHINE CO.

ANN ARBOR, MICHIGAN

See Ancecase First — for the Best in Broaching Tools, Broaching Machines, Special Machinery

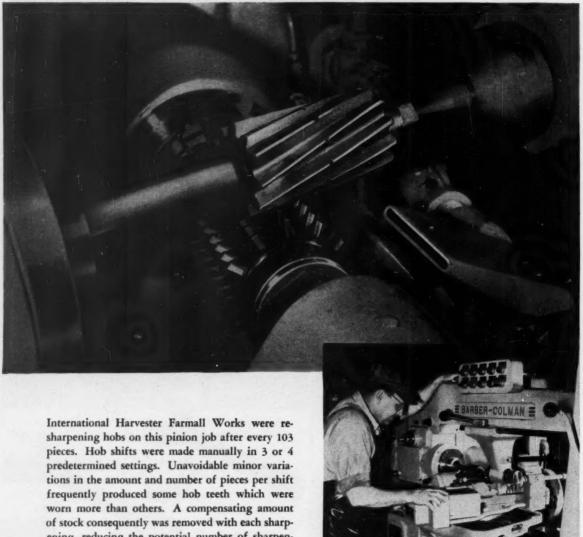




AMERICAN.

ROCKFORD MADE MEANS PRECISION MADE...ROCKFORD

AUTOMATIC HOB SHIFTING



ening, reducing the potential number of sharpenings.

New Barber-Colman No. 16-16 Hobbing Machines, equipped with Automatic Hob Shifters, were installed. Now, after each cut, the hob is automatically shifted .0085" to a new cutting position. Production has jumped to 233 pinions per hob sharpening. All hob teeth show a uniform amount of wear, requiring only .010" stock removal per sharpening. Time required on sharpening machines has been reduced accordingly. Tool costs have been cut to one-third.

KFORD... FOR ACCURATE, FAST METAL REMOVAL



INCREASES HOB LIFE

INTERNATIONAL HARVESTER GAINS 130 MORE GEARS PER SHARPENING

Based on the number of hob sharpenings and the amount of stock removed per sharpening, these results indicate an increase in tool life of from 103 to 233 pieces per sharpening.

When you control uniformity and frequency of hob shifting, costs go down — tool life and production go up. The Barber-Colman Automatic Hob Shifter is equipped with change gears so that the hob can be shifted a pre-determined amount after each work load has been cut. Thus, the amount of shift can be selected so that the maximum number of pieces per hob will be produced. Safety interlocks prevent the shifter from operating during the cutting cycle, and torsion bar springs clamp the hob slide rigidly under maximum load.

See your Barber-Colman representative today, and ask him about Automatic Hob Shifting for your gear production. Write us for a copy of the new No. 16-16 Hobbing Machine Bulletin.



HOBS • CUTTERS • REAMERS
HOBBING MACHINES
HOB SHARPENING MACHINES



Barber-Colman Company

GENERAL OFFICES AND PLANT, 121 ROCK STREET, ROCKFORD, ILLINOIS, U.S.A.

HOBS AND MACHINES SINCE 1911

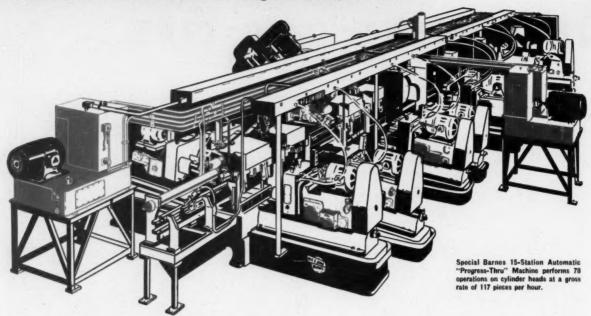


MADE IN

FOR METAL REMOVAL WITH ACCURACY AND SPEED...ROC

ROCKFORD

SPECIAL HYDRAULIC EQUIPMENT...



... another integral part of a coordinated

6-POINT MACHINE TOOL BUILDING SERVICE

by W. F. & John Barnes

Unlimited Designs Help Provide Peak Efficiencies

The John S. Barnes hydraulic systems employed on Barnes Units for machine and fixture actuation have long been noted for their outstanding efficiency and long trouble-free service. As a result, the accumulated experience of this division is a vital part of the Barnes 6-point machine tool building service. The example above illustrates a typical application on a high production cylinder head machine. The individual heads have self-contained units; other units for clamping, positioning and transfer of workpieces are installed as illustrated. All are built to JIC standards for easy accessibility. While some components are standardized, often special valves and mountings are desirable and are built to best suit the job needs. Thus, there are no limitations, which permits achieving peak machining efficiency.

Undivided Responsibility Assures Better Service

Because all planning, engineering, and manufacturing efforts at Barnes are closely coordinated, you get a complete machine tool building service all from one convenient, dependable source. Broad, varied engineering experience and creative skills have been developed over the years which enable Barnes to help you solve many troublesome production problems. If your present or future machining needs call for faster, more efficient methods, we will be glad to work with you as rapidly as current conditions will permit.

Write for Juli Details Ask for free booklet "Coordinated Machine Engineering," describing the details of Barnes machine tool building service. Illustrates modern machines and mass production techniques.

W. F. & JOHN BARNES COMPANY 312 S. WATER ST., ROCKFORD, ILLINOIS

BARNES MACHINE TOOL BUILDING SERVICE INCLUDES

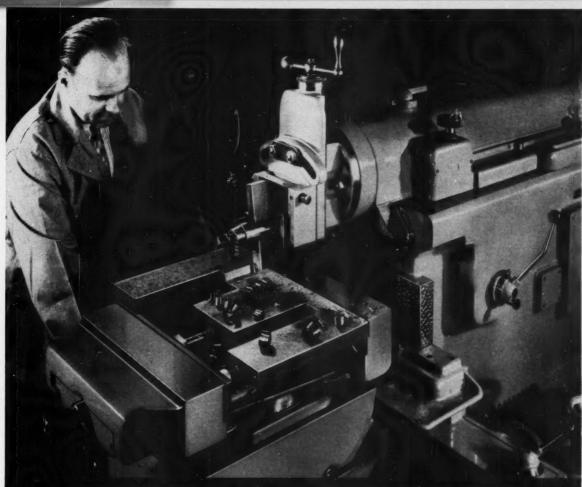
- SPECIALIZED MANUFACTURING FAC-ILITIES — 75 year background, large well equipped plant efficiently tooled to produce high production machines.
- 2 SPECIAL HYDRAULIC EQUIPMENT as illustrated above.
- 3 SPECIAL GAUGES, FIXTURES, TOOLS—designed for each individual machining problem, assure accuracy of operations at high production speeds.
- 4 SPECIAL ELECTRICAL EQUIPMENT and CONTROLS Individually designed and built for maximum safety and ease of control with circuits that assure the most dependable coordination of all machine functions.
- 5 SPECIAL HANDLING AND CONVEYOR EQUIPMENT designed and built to reduce work handling, effect maximum safety and efficiency.
- 6 COORDINATED DESIGN AND ENGINE-ERING — Mechanical, Hydraulic, Electrical, Process, Tool, and Fixture Engineers work together at Barnes. Team-work solves complex problems quickly.



MULTIPLE SPINDLE DRILLING, BORING, TAPPING MACHINES - AUTOMATIC PROGRESS-THRU AND TRANSFER TYPE MACHINES

CKFORD... MACHINE TOOL PLANTS CLOSE TO YOUR PLANT





INCREASE YOUR OPERATING EFFICIENCY... with

Hydraulic drive permits you to change stroke lengths instantly, even while the shaper ram is in motion. It also gives you a wide range of cutting speeds and feeds, infinitely adjustable.

With flame-hardened and ground ram ways, Rockford Shapers assure long life and constant accuracy for maximum operating efficiency.

Ask a Rockford Machine Tool Co. representative to show you how you can increase your operating efficiency with Rockford Hydraulic Shapers.

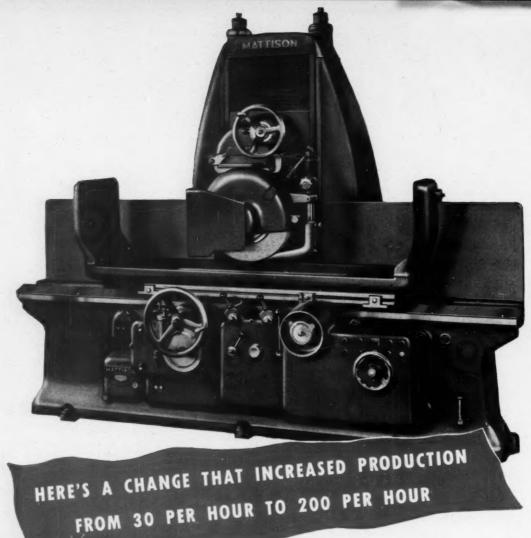
528



2500 Kishwaukee Street • Rockford, Illinois



CENTER OF MACHINE TOOL EXCELLENCE...ROCKFORD





Both sides of type-stamps are now ground 200 per hour on a Mattison Grinder. Previous production — 30 per hour.

♠ Because of the greater load and grinding area of their Mattison High Powered Precision Surface Grinder, Geo. T. Schmidt, Inc., Chicago, Illinois have been able to effect considerable savings in grinding time over their previous method. As an example — the type stamps shown in the picture above were formerly ground a few pieces at a time on a small grinder — 30 per hour. The Mattison Grinder they are now using provides larger table space and a larger grinding wheel together with the necessary power and stability to permit the grinding of more pieces per load at a production rate of 200 per hour. Similar results are obtained on other parts.

Mattison High Powered Precision Surface Grinders have the high power and rugged double-column construction for rapid stock removal and the precision necessary for high quality finish and accuracy to close limits.

This combination not only will enable you to step up production on small parts, but permits grinding large work which previously could not be handled. For further information send for free circular.

MATTISON

MACHINE WORKS

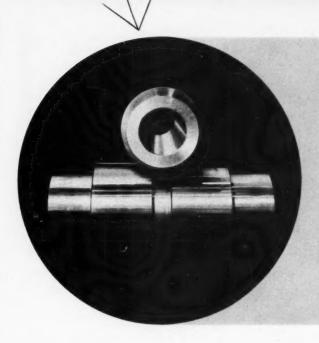
TROCKFORD · ILLINOIS

CKFORD... FOR MACHINES DESIGNED TO SUIT YOUR PRODUCTION



BARNESDRIL HONES

Critical Spindle Sleeve Surfaces within .0002"-.0004"



For production of boring machine spindle sleeves with a 5" bore, a prominent machine tool firm* specifies rigid .0002".0004" tolerances. BARNESDEIL Honing Machines meet those exacting requirements... and achieve highest standards of roundness and straightness of bore. Selected lubrication surface pattern is held consistently.

BARNESDAIL Honing Machines offer production insurance on your critical surface requirements. Use BARNESDAIL skills, tailored to your needs . . . consult a BARNESDAIL Engineer today.

* Name on request.

BARNESDRIL

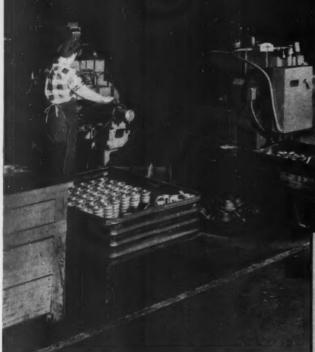
BARNES DRILL CO.

820 CHESTNUT STREET . ROCKFORD, ILLINOIS



YOU'LL FIND YOUR PRODUCTION MACHINE TOOLS IN...ROCK

"Better than 2 to Production Increase"



of 150 to 200
Lot Sizes

This modern turning battery includes two Model 4A, four Model 8A and one Model 12A Sundstrand Automatic Lathes. Thirty-two different parts of cast iron and steel are turned in lot sizes varying from 150 to 200 pieces per lot. Production increase is as high as from 40 to 150 parts per hour compared to former method.

One Operator Handles 2 Machines

... Turning 32

Because of the ease and simplicity of operating Sundstrand Automatic Lathes, one operator is able to handle 2 machines. If you have turning problems consult a Sundstrand Methods engineer. There is no obligation for this service.



RIGIDMILS

AUTOMATIC LATHES

HYDRAULIC EQUIPMENT

THE STATE OF THE

CKFORD...A CONVENIENT SOURCE FOR PRODUCTION NEEDS



Each of these Sundstrand Lathes has these Modern Production Features

4 MODELS

COVER HP RANGE

Horsepower

All new Sundstrand Automatic Lathes have been redesigned for greater rigidity and larger spindle drive motors. They have ample power for use of carbide cutting tools and are capable of doing more work.

Speeds

Spindle speed range ratios have been increased to 30 to 1 to obtain maximum in cutting efficiency over a wider range of sizes of parts and material. The spindle unit is equipped with two driving gear centers, which increase the range between high and low spindle speeds. In addition, four speed changes can be obtained from one set of gears instead of the usual two.

Feeds

A wider feed range has been provided to enable the handling of a greater range of parts and materials at maximum cutting efficiency. The New Models 4A, 8A and 12A have a ratio of 18 to 1 between high and low feeds — Model 16 has an even greater range.

Carriage Adjustments

Both front and rear carriage of the latest Sundstrand Automatic Lathes are adjustable full length between headstock and tailstock centers — another important new feature.

Simple, Fast Set-up

Convenient location of pick-off gears for changing spindle speeds and front and rear carriage feeds is provided. Feed and speed chart and pick-off gear storage compartment are readily accessible for quick set-up or changeover.

Cycle Changeover

Complete control of all cycles is provided by adjustment of dogs on a disk. Making cams is eliminated. Changing position of dogs on disk changes length of rapid approach, feed and rapid return strokes — enables operator to set up cycle quickly and change over from one job to another easily.

Automatic De-clutching

All new models have been provided with automatic declutching between spindle and spindle motor with self-adjusting magnetic clutch and brake for quick stopping of spindle rotation.

Screw Feed to Front Carriage

All new Sundstrand Automatic Lathes have screw instead of rack feed to the front carriage — resulting in fine finish and long tool life.

OF 3 14 17				
	MODEL 4A	MODEL BA	MODEL 12A	MODEL 16
SPINDLE MOTOR	3 to 71/2 HP	10 to 25 HP	20 to 50 HP	50 to 75 HP
SPEED RANGE (Type A) (Type B)	60 to 1800 RPM 120 to 3600 RPM	40 to 1200 RPM 60 to 1800 RPM	30 to 900 RPM 40 to 1200 RPM	15 to 750 RPM
FEED RANGE	.003 to .048 IPR.	.004 to .070 IPR	.004 to .070 IPR	.0025 to .100 IPR
FRONT CARRIAGE: Longitudinal feed with angular feed-in, max. Swing over cross slide, max. Rapid traverse rate	5" 83/4" 275"	6" 12½" 250"	8" 151/4" 250"	12" 17" 250"
REAR SLIDE: Max. Stroke	4"	51/2"	61/2"	8"
LENGTH BETWEEN CENTERS	15, 24 & 36"	24, 36, 48 & 60".	24, 36, 48 & 60"	36, 60 & 84"

Additional Data . .

The complete new line of Sundstrand Automatic Lathes includes the Models 4A, 8A, 12A and 16 ranging from 3 to 75 HP. Write for complete information on these new machines today. Ask for bulletin 625.





SUNDSTRAND

Machine Tool Company

2530 Eleventh St. Rockford, Ill., U.S.A.

DRILLING AND CENTERING MACHINES

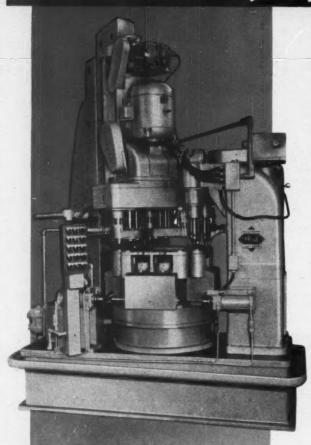
SPECIAL MILLING AND TURNING MACHINES



FOR PRODUCTION MACHINE TOOLS IT'S...ROCK

ILLINO15, U.S.A

Rehnberg-Jacobson



"This customer came back at us for a machine to produce twice as much as the first one he got. Here is what we made up for him..."

Whatever the circumstances, we try to give a man what he asks for. That usually takes a fair amount of Versatility and Ingenuity. Here is a case in point. This second machine has just double the capacity of its successful predecessor, to meet increased production requirements. The cost, on a comparable basis, is only about 50% greater. If he comes back and wants to double again, we figure to be ready for him.

GENERATOR FRONT PLATES



The machine has an R-J all-mechanical Screw Feed Unit driving a head carrying ten drilling spindles for one station and eight spindles for second operations at the next station. The other unit has six tapping spindles. The table is an R-J Rim Ball Index Unit with fixtures carrying two pieces at each of four positions. Operations include drilling, spot facing, chamfering, counterboring, and tapping. (If you wish to compare, the previous machine is shown in "Machinery" for February, 1952.)

REHNBERG-JACOBSON MFG. COMPANY

DESIGNERS & BUILDERS OF SPECIAL MACHINERY



2135 KISHWAUKEE ST. ROCKFORD, ILLINOIS

CKFORD...city of machine tool specialists

Harry History, 10



GERSOI The Key to Maximum Production

An Ingersoll Cutter Grinder may cost only 1/100th as much as the production equipment it services, but its importance is far out of proportion to its price. Adequate facilities for grinding cutters accurately and quickly are essential to get maximum returns from large investments in costly production machinery.

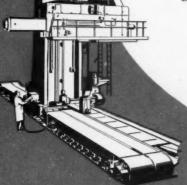
You are undoubtedly sacrificing production

- (1) if you do not have enough Ingersoll grinders, or
- (2) if your present Ingersoll grinders are in need of replacement.

The Ingersoll Cutter Grinder . . .

Grinds inserted blade cutters more accurately because the cutter is located on the grinder in the same manner as on the milling machine spindle.

Grinds cutters faster because the face, periphery, and corners are ground in a single setting of the cutter.



Write for Ingersall Cutter Grindley Manual 588

The Ingersoll Spin-Grinding Attachment, available on new grinders, cylinder-grinds blades to uniform height on face and periphery. It reduces the time for sharpening a 10-inch heavy duty Shear Clear Face Mill with new T.C. blades from 2-1/2 hours to 2 hours.

THE INGERSOLL MILLING MACHINE CO. ROCKFORD, ILLINOIS





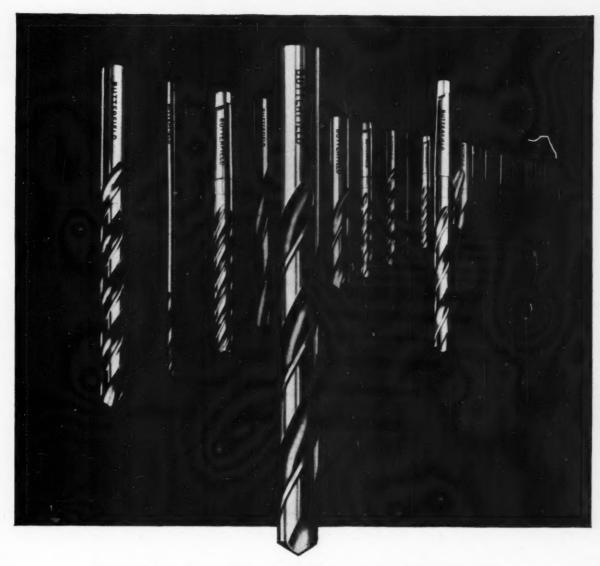
YOU'LL FIND YOUR PRODUCTION MACHINE TOOLS IN ... ROCKFOR



MULTIPLE-SPINDLE DRILLING, BORING, TAPPING MACHINES - AUTOMATIC SCREW MACHINES - AUTOMATIC TRANSFER PROCESSING MACHINES

OCKFORD... A CONVENIENT SOURCE FOR PRODUCTION NEEDS





NEW RECRUITS...100% INSPECTED ...JOIN THE BUTTERFIELD DIVISION!

Butterfield Twist Drills Are Here — For Every Purpose. The Latest Additions To This Famous Line.

Now you can get twist drills of the same high quality as the Butterfield taps, dies and reamers that have served you so well over the years. As with all Butterfield products, each drill is individually inspected for accuracy and quality — 100% inspection for 100% satisfaction. Union Twist Drill Company, Butterfield Division, Derby Line, Vermont. In Canada: Rock Island, Quebec.

BUTTERFIELD

THE 100% INSPECTED TOOLS

Every Tool Individually Inspected

TAPS . DIES . REAMERS . SCREW PLATES . TWIST DRILLS

Bar stock being tested for microstructure ... one step in Butterfield's 100% inspection.



SEE YOUR NEARBY BUTTERFIELD DISTRIBUTOR FOR PROMPT DELIVERIES AND SERVICE

MACHINERY, November, 1952-89

6 reasons why





RELIANCE V+S

is the result of nearly 50 years' experience in the engineering and application of Adjustable-speed Drives.

Write today for important NEW data on Reliance V*S Drive (3/4 to 300 hp.) and how it can give you greater flexibility of operation to increase production and lower costs. Ask for V*S Drive Bulletin D-2311.

RELIANCE-V*S is important to you



quick starting — without use of clutches; smooth action protects fragile materials.



quick, smooth stopping of any load through positive electrical braking which never wears out or needs adjustment.



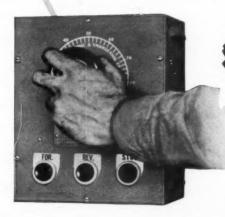
controlled acceleration and deceleration—your operator can increase or decrease speed at any desired rate; provides for best machine performance.



unlimited speed changes over a wide range permit selection of the right speed for machine, material and operator to secure maximum production.



inching, jogging or creeping through adjustable slow speeds; your operator can slow down a machine for inspection, then accelerate quickly and exactly to previous working speed.



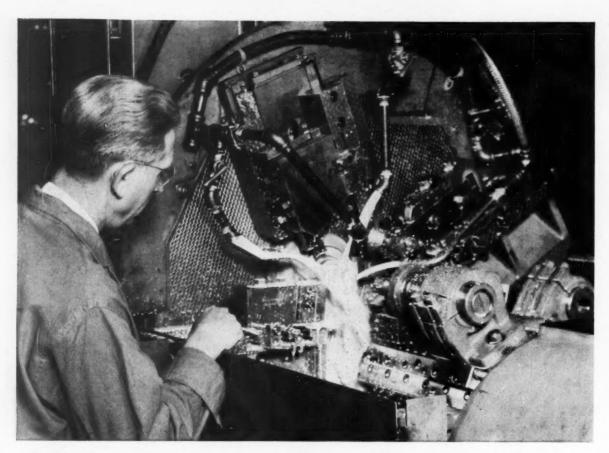
convenient-to-operate controls grouped and located where your operator can quickly, easily and safely control all functions of his machine. Operator fatigue is reduced—there is less production lag over the course of a shift—scrap losses are held to a minimum.

Sales Offices in Principal Cities

RELIANCE ELECTRIC AND ENGINEERING CO.

1077 Ivanhoe Road, Cleveland 10, Ohio

Canadian Division: Welland, Ontario



MODEL M...more than $6\frac{1}{2}$ times faster on this shaft!

You can spot one of the important reasons for this production increase right in the design of the Acme-Gridley Model M Single Spindle Automatic. There are three automatic spindle-speed ranges to give the correct surface speed for any kind of cut, any diameter. On this job, for example, the operation sequence goes from carbide cuts, to high-speed steel for forming cuts, to die-head threading—and back to

high-speed finishing cuts.

There are other time-saving features, too—independent camming for the eight tool slides, to permit combining cuts; wide, open tooling zones, for easy access; heavy, rigid frame construction, to permit the use of carbide tools; simple camming, for quick change-overs.

These and many others are explained in Bulletin M-50. Be sure to ask us for your copy.

JOB FACTS

PART......Steel Sprocket Shaft, 53/4" long

MACHINE TIME . . . 1 Min., 50 Sec.

FORMER MACHINE TIME.. 12 Min.
(Engine Lathe)

MACHINE 3½" Acme- Gridley Model M Single Spindle Automatic.

The NATIONAL ACME CO.

170 EAST 131st STREET . CLEVELAND 8, OHIO

Acme-Gridley Bar and Chucking Automatics: 1-4-6 and 8 Spindle - Hydraulic Thread Rolling Machines - Automatic Threading Dies and Taps - The Chronolog - Limit, Motor Starter and Control Station Switches - Solenoids Centrifuges - Contract Manufacturing



Think of tool steel - think of Crucible! That's the reputation we've had for over half a century with our tool steel users. We've never stopped working to maintain our leadership . . . leadership that has kept us the country's number one tool steel producer.

Crucible research and development continues to match Industry's need for new and improved tool steels. You can profit from the experience gained by Crucible in the application of tool steels to thousands of uses. Our metallurgical service is freely available to you . . . and our conveniently located warehouses maintain a full supply of tool steels for prompt delivery.

SEND TODAY for the unique Crucible Tool Steel Selector - a twist of the dial gives the tool steel for your application.

Rex® High Speed Steels Peerless Hot Work Steels Chro-Mow® Sanderson Carbon Tool Steels Ketos ® Airkool Die Steel Airdi® 150 Nu-Die V Die Casting Steel CSM 2 Mold Steel La Belle® Silicon #2 Atha Pneu

SPECIFY YOUR TOOL STEELS BY THESE **BRAND NAMES**

Crucible Steel Co	mpany of Americ	ca	1
Dept. M, Chrysle	r Building, New '	York 17, N. Y.	Crucible
Name			
Сотрану		Title	
Address	City	State	9" diameter, 3-colors

CRUCIBLE

first name in special purpose steels

52 years of Fine steelmaking

TOOL STEELS

CRUCIBLE STEEL COMPANY OF AMERICA . TOOL STEEL SALES . SYRACUSE, N. Y.

MACHINERY, November, 1952-93

not in the blueprint...

A great many who send blue prints to the Bunting Brass & Bronze Company have in mind things not shown by the drawings. They know that in the event of an unforeseen happening of any kind they can depend on the Bunting organization for consideration, cooperation and prompt, specific help. Ask any Bunting customer.

> The sleeve bearing is not complex in structure; it conforms readily to design requir most adaptable of all sleeve bearing materials; es excellent anti-friction property With proper film lubrication, its coefficient of fretion is as low as can be obtained with any other bearing type. A successful Bunting Bronze bearing installation is readily attainable. We eak the opportunity to work with you, and to

quote on your requirements.

THE BUNTING BRASS & BRONZE COMPANY . TOLEDO 1. OHIO . BRANCHES

94-MACHINERY, November, 1952

Tool Steel Topics





These bolt-header parts represent some of the bon tool steel at cald-heading quality. As a large user of our own toel steels, we gain valuable experience to help solve our customers' problems.

How Our Proving Ground Helps Tool Steel Users

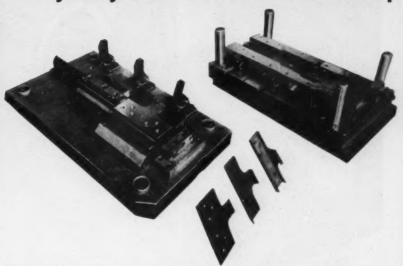
Many people think of a particular tool steel in terms of its chemical analysis. Others may classify it according to its properties. But when all's said and done, from the standpoint of the user a particular tool steel is one that does or doesn't do the job on a specific application.

We ourselves are one of our own largest tool steel customers. We use tons of Bethlehem tool steel every year. Our steel and manufacturing plants, our fabricating works and shipyards, make a vast proving ground, giving us very special opportunities to check up on our tool steel, watching it at work on nearly every kind of job imaginable.

That helps us - and our customers in two ways. First, it yields the kind of first-hand practical experience in the treatment and application of the various grades of Bethlehem tool steel that can only be gained by living with them every day. Second, it provides a huge store of valuable information on tool design, heattreatment, and tool and die performance.

All this helps not us alone but, as we say, helps us to help our customers to get the most out of tool steel. So if you have a problem in any way related to tool steel selection or treatment, we invite you to tell us about it. The chances are several to one that our experience can be helpful. It is yours for the asking.

Heavy-duty Die Packs 300-ton Wallop



This three-stage progressive die punches. shears, trims, and forms parts from steel plate in a 300-ton press. It turns out about 2500 each shift. All wearing portions of the die are made of 67 Chisel, our chrome-tungsten grade of shock-resisting steel. Hardened to Rockwell C-53, it produces upwards of 30,000 pieces before redressing is needed. The guard-rail clip angles, shown in foreground, are made from high-earbon steel plate of approximately .218 in. gage.

Renowned for its extreme toughness, 67 Chisel has excellent wear-resistance for a wide range of heavy-duty jobs. It's often used for punches, swaging dies, chipping chisels and machine parts subject to repeated shock . . . heavy shear blades for cold work and also for hotwork jobs up to 1000 F. And it's a popular choice for master hobs.

Tools made from 67 Chisel are readily carburized. This makes possible a very hard surface, reinforced by a core that's really tough.

67 Chisel is an easy steel to machine and heat-treat. It's stocked in many sizes for quick shipment.

Its typical analysis:



BETHLEHEM TOOL STEEL ENGINEER SAYS:

Keep those cutting tools sharp

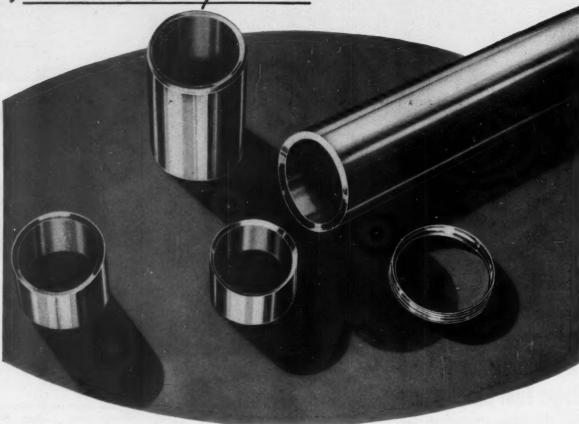
In many shops the resharpening of production cutting tools is neglected too long. In an effort to keep output at a peak, such tools are sometimes kept in use beyond the point where the cutting edges become excessively dull.

Just what happens when edges are dull? For one thing, the dull edges begin to cause an increase in the load on the shearing or cutting edges. If the dullness is carried to extremes, tools will break. Dull cutting edges also produce rough surfaces on the parts; this may result in rejection due to defects or because the tolerances have been exceeded.

If resharpening is delayed too long, it may be impossible to recondition a tool properly. Deep spalls, cracks, and gouges cannot be removed. Usually there is an economic balance point on each type of operation where it is best to resharpen. This point must be determined for each operation. Regular inspection of tools will show any unusual conditions causing excessive dulling.

Preventive maintenance of cutting edges pays off in longer tool life and fewer broken tools.

Machine Shops:



try this solid stock with a built-in hole

• It's surprising how much it costs to bore a hole through ordinary solid stock. First, of course, is the time element. Plus tool wear. Then, add the cost of the bored out steel that ends up as scrap.

Often you can save this time and scrap and tool wear if you use Shelby Seamless Mechanical Tubing for making parts. It comes in a *complete* range of sizes, wall thicknesses, finishes and steel analyses. And the basic shape is already made.

Shelby Seamless is just the thing for volume production shops. Our precision manufacturing methods assure complete uniformity. You can be sure of identical parts whether you make hundreds or thousands of units daily.

A Shelby Seamless Tube is pierced from a solid billet of uniform steel. This manufacturing process is your assurance of uniform wall strength. In fact, Shelby Seamless is as sound as a solid forging.

For more information on this versatile tubing, write to National Tube Division, United States Steel Company, 525 William Penn Place, Pittsburgh 30, Pennsylvania.

All National Scamics: Tubing is pierced from solid billets of uniform stool—the one manufacturing method that assures uniform wall strength.



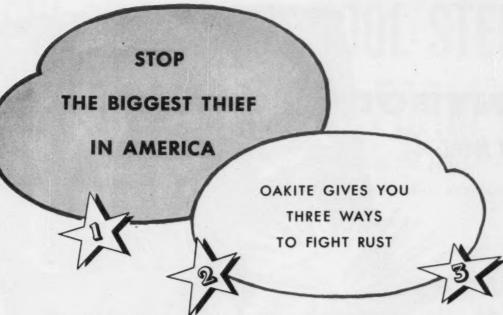
NATIONAL TUBE DIVISION, UNITED STATES STEEL COMPANY, PITTSBURGH, PA. (Tubing Specialties)

UNITED STATES STEEL EXPORT COMPANY, NEW YORK



U-S-S SHELBY SEAMLESS MECHANICAL TUBING

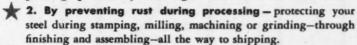
UNITED STATES STEEL



Day and night-wherever your steel is stored or handled-RUST, the biggest thief in America, is robbing you of production, robbing you of profit.

Oakite can help you defeat rust three ways:

1. By removing rust from raw steel - often eliminating a pickling operation by removing oil and rust at the same time.



3. By preventing under-coat rusting of painted products combining cleaning, paint-conditioning and rust prevention into one operation.



One department saves \$1,000 a month

An enterprising foreman for a large Eastern manufacturer of precision steel parts kept a six-month record of the results of a special anti-rust campaign in his department.

anti-rust compaign in his avoing of time for-After determining the saving of time formerly spent on re-processing rusted parts, he told the Oakite Technical Service Repretentative who had helped in the campaign: "This saving has been over \$1,000 a month."

Today the company is intensifying the anti-rust campaign under the competent direction of that foreman—and is extending the campaign to other departments.

One of their chief weapons in stopping rust—during grinding, polishing, tumbling, assembly and other operations—is Oakite Special Protective Oil.

A 16-page illustrated booklet on "How to prevent rust with Oakite Special Protective Oil" is included in the FREE Oakite Anti-Rust Kit offered in the coupon.

For the Oakite Anti-Rust Kit that tells about these three ways to stop RUST in your plant, just drop us a note or mail the coupon.

SPECIALIZED		- CLEAN	VING
OA	KI	T	F
MATERIALS .	MATHO	1 . 118	VICE

OAKITE PRODUCTS, INC. 26 Rector St., New York 6, N. Y.

Please send me the FREE Oakite Anti-Rust Kit.

I am particularly interested in:

- □ Removing rust from raw stock.
- Preventing rust during processing.
- Preventing under-coat rusting of painted products.

Name

Company

Melden



That's right! If they can weld any metal, they can weld magnesium. Nearly all of the common welding techniques can be employed. Inert-gas shielded arc welding, gas welding, and electric resistance welding are all being used successfully on magnesium.

Most forms of magnesium are weldable. While joint strengths will vary with different alloys, typical properties of welded butt joints show tensile strengths up to 42,000 psi, and elongation up to 12%. In addition, magnesium welds

are comprised of dense metal and are substantially free of microporosity.

The combination of relatively high weld strength and minimum specific gravity found in magnesium generally permits the design of welded magnesium structures that are lighter, stronger, and more rigid than is possible in other light metals. Dow has over 30 years of experience in the production and fabrication of magnesium—a call to your nearest Dow sales office will put this knowledge at your disposal.

THE DOW CHEMICAL COMPANY

Magnesium Department

Midland, Michigan

New York • Boston • Philadelphia • Atlanta • Cleveland • Detroit Chicago • St. Louis • Houston • Son Francisco • Los Angeles • Seattle Dow Chemical of Canada, Limited, Toronto, Canada



NOW GRAPH-MO° TOOL STEEL IN HOLLOW BAR FORM

New "Graph-Mo Hollow-Bar" combines the faster machining and longer wear of Graph-Mo with the economy of a hollow bar section

ADVANTAGES OF GRAPH-MO

Most stable tool steel
ever made
Outwears others 3 to 1
Machines 30% faster
Minimum tendency to pick
up, scuff or gall
Uniform response to heat
treatment

ADVANTAGES OF HOLLOW BARS

No drilling
Finish boring is first step
Less machining time
Less scrap loss
More parts per ton

of steel

ADVANTAGES OF

"GRAPH-MO HOLLOW-BAR"

THE Timken Company announces a new product— "Graph-Mo* Hollow-Bar"! It gives you all the advantages of Graph-Mo tool steel, plus the advantages of a hollow bar section.

If you make ring-shaped tool steel parts you can eliminate drilling, make finish boring your first production step. You save machining time, save steel! The hole is already there!

And you get all the proven advantages of Graph-Mo a special tool steel that contains free graphite and diamondhard carbides in its structure.

Graph-Mo outwears other tool steels an average of 3 to 1! Reports from dozens of users prove it!

Machinability tests show Graph-Mo machines 30% faster than other tool steels!

It's the most stable tool steel made! A 12-year stability test of a typical Graph-Mo steel master plug gage showed less than 10 millionths of an inch change in dimension.

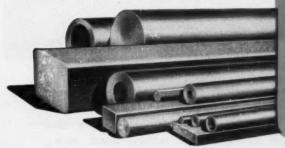
Graph-Mo has minimum tendency to scuff, pick up or gall. And it gives uniform response to heat treatment.

Add it all up and you've got "Graph-Mo Hollow-Bar" the big news of the year for makers of ring gages, dies and other annular tool steel parts.

"Graph-Mo Hollow-Bar" is available in sizes ranging from 4" to 16" O.D. with a variety of wall thicknesses. Distributed through A. Milne and Company and Peninsular Steel Company, it's available in the following cities: New York, Boston, New Britain, Philadelphia, Buffalo, Pittsburgh, Cleveland, Akron, Dayton, Toledo, Detroit, Grand Rapids, Indianapolis, Chicago and San Francisco.

Write today for complete information to The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

YEARS AHEAD-THROUGH EXPERIENCE AND RESEARCH



TIMES

TABLE HARE CO. I. S. PATOR

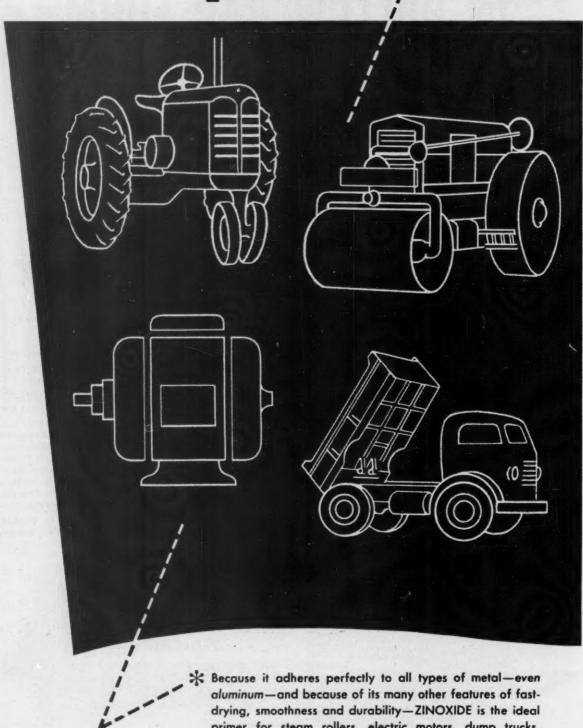
FINO Alloy

STEEL

SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS TUBING

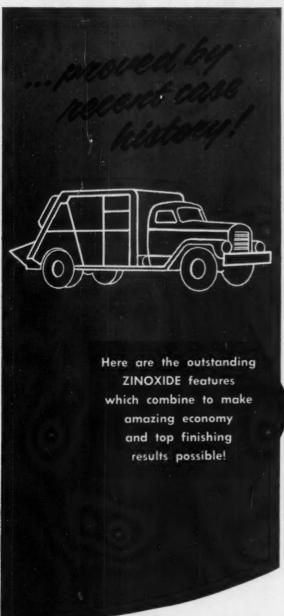
MACHINERY, November, 1952-99

Lowe Brothers ZINOXIDE produces/a better



primer for steam rollers, electric motors, dump trucks, tractors and many, many other products.

Primer finish at ½ the cost!



A large, well-known manufacturer of load packers* wanted to reduce finishing costs without sacrificing quality of the finished product. A Lowe Brothers "Finishing Specialist" recommended that this manufacturer replace his one-coat operation with a two-coat system incorporating new ZINOXIDE primer and a finishing coat of enamel. ZINOXIDE was put to the test, and an intensive time study revealed that the new system slashed 50% off material and application costs! What's more, a better looking finish resulted—a better wearing finish, too, for ZINOXIDE gave better "hold out" on the ename!

1. Adheres perfectly to all types of metal—and that includes aluminum! 2. Dries to handle in 15 minutes! Can be baked at 300° for 15 minutes or more. 3. Eliminates bad after-effects of "overspray"—no rough primer surface to sand before finishing! 4. Durable! Castings primed with ZINOXIDE can be stored outside without rusting. Pigments used are best rust inhibitors known. 5. ZINOXIDE can be recoated quickly with lacquer or any type of ename!

Perhaps ZINOXIDE is just what you've been needing to bring new finishing efficiency and finer results. Certainly worth finding out, isn't it? Ask a Lowe Brothers "Finishing Specialist." Write today.

THE LOWE BROTHERS COMPANY • Dayton 2, Ohio Industrial Division

This advertisement is based on facts from Lowe Brothers industrial case history files.





First of All, a Good Blank

There's beautiful work-manship in that gear, and everything checks as it should. It's been an easy cutting job, for the steel is solid and uniform throughout. The gear was first of all a good blank—a circular forging made in Bethlehem's special mill that upsets, forges, and rolls in a single operation.

A great many thousands of Bethlehem blanks have come out of that mill, blanks that became fine gears and many other products. Tough, homogeneous blanks with uniform density and excellent grain flow.

They machine so dependably, with no hidden trouble down beneath. That's one of the reasons customers like them for spur, bevel, miter, herringbone, and other types of gears. Moreover, their high strength and great durability frequently make possible the use of thinner sections, thus saving weight.

When planning gears in the future, investigate these sturdy Bethlehem blanks. They are available untreated or heat-treated, in sizes ranging from 10 to 42 in. OD. You'll find them every bit as strong, tough, and reliable as we say.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Expart Distributor: Bethlehem Steel Expart Corporation



BETHLEHEM ROLLED-AND-FORGED CIRCULAR PRODUCTS

102-MACHINERY, November, 1952

Now!
Large diameter
L

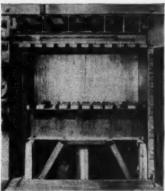
ACIPCO steel tubing, centrifugally cast, is now available from Frasse in sizes ranging from 2" to 50" O. D., wall thicknesses of 1/4" to 4", in lengths up to 16 feet. The more popular sizes are immediately available from stock. Other sizes and analyses (in quantities as little as 16 feet) can be made to order promptly.

Government, ASTM, AMS, ABS, ACI and AISI specifications can be readily met. ACIPCO tubing is made in any standard or non-standard analysis. Steel used

> in its manufacture is produced in electric furnaces.

Typical applications for ACIPCO tubing include: Hydraulic cylinders, ship propulsion shafts, cracking still tubes, retorts, and paper mill rolls. In addition, it has received wide recognition as a component in weldment applications. Why not investigate the many advantages offered by this versatile product?

Frasse Engineering Memorandum #11 covers in detail the characteristics, properties, analyses and pertinent facts about ACIPCO centrifugally cast steel tubing. Mail the coupon below for your free copy today.



Fabrication of this hydraulic baling press required a 22'6" ram of AISI 1030, and a 21'6" cylinder of AISI 1025. ACIPCO tubing, circumferentially welded to proper length, was used successfully for both items. The manufacturer, Consolidated Baling Machine Co., relied on Frasse to furnish ACIPCO tubing in the size, length and analysis needed.



COMPLETE FACTS ABOUT ACIPCO CENTRIFUGALLY CAST TUBING MAIL TODAY!

Peter A. FRASSE and Co., Inc 17 Grand St., New York 13, N			64-B2
Please send me, without Centrifugally Cast Steel Tubing		e facts abou	ACIPO
Name	************************************	Title	**********
Firm	***************************************	****************	*************

Peter A	FRASS	E and C	Co., Inc.
New York 13, W. Y. 17 Grand St.	Philadelphia 29, Pa. 3911 Wissahickon Ave.	Builalo 3, N. Y. 50 Exchange St.	Syracuse 1, N. Y. P. O. Box 1267
Walker 5-2200	Baldwin 9-9900	Washington 2000	Control of the last of the las
Lyndhur	it . Hartford .	Rochester a	Bultimore

CUMBERLAND GROUND BARS

We manufacture 8" diameter, 7-1/2", 7", 6-1/2", 6", and also odd and intermediate sizes down to and including 1-1/8".



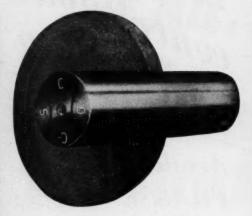
ON THE WEST VIRGINIA SHORE, OVERLOOKING THE POTOMAC RIVER, STANDS THE JAMES RUMBEY MONUMENT

> The first practical steamboat in the world was run on the Potomac River a few miles below Cumberland, Maryland.

> George Washington said in his dairy, under date of September 6, 1784: "Remained at Bath all day and was showed the Model of a boat constructed by the ingenious Mr. Rumsey, for ascending rapid currents by mechanism; the principles of this were not only shown, and fully explained to me, but to my very great satisfaction, exhibited in practice in private under the injunction of весгесу-

> At a later date GEORGE WASHINGTON said in his diary: "Spent the afternoon with Mr. Rumsey and then Alexander Hamilton and I rode on to Cumberland, Maryland."

STEEL COMPANY



Symbol of Quality

Approximately 100 years after the exhibit of this steamboat, Cumberland began grinding bars. They found through experience this was the best method by which accurate steel bars could be produced. These bars are so carefully ground that they are adapted for mass production where gears, pulleys, sprockets and bearings must slide on the bars without delay due to filing or fitting.

IMMEDIATE BARS

imere, Maryland—Addison Clarke & Bro. on, Mass.—Hawkridge Brothers Company gaport, Conn.—Hunter & Havens, Inc. 16, N. Y.—Jos. T. Ryerson & Son, Inc. bridge, Mass.—Brown-Walse Company lott, No. Carolina—Edgeomb Steel Co. 190, III.—Central Steel & Wire Co. nnatl, Ohio—Jos. T. Ryerson & Son, Inc. 1 and, Ohio—The Biasett Steel Company it, Michigan—Central Steel & Wire Co. 1 (Michigan) Control of Conn.—Hunter & Havens, Inc. 1 (Michigan) Central Steel & Son, Inc. 1 (Michigan) Control of Conn.—Hunter & Havens, Inc. 1 (Michigan) Conf. On the Confedent of Conn.—Hunter & Mill Supply Conn. 1 (Michigan) Control of Conn.—Hunter & Mill Supply Conn. 1 (Michigan) Confedent of Conn.—Hunter & Mill Supply Conn. 1 (Michigan) Const. Const. Control of Conn.—Hunter & Mill Supply Const. Const

CUMBERLAND, MARYLAND, U. S. A.
ESTABLISHED 1845
INCORPORATED 1892



Good coolant practice makes machining aluminum easy

If your tools dull quickly, your work runs hot or chips pile up in the tool zone, check your coolant.

Be sure you are using an adequate volume of coolant consistent with operating conditions. Keep the nozzles open. Direct the coolant stream to hit the work and tools, at the proper angle. Chips should be washed away to prevent fouling the tools. Use a good cutting fluid. Special aluminum coolants generally consist of light mineral oil with 5—10 per cent fatty additions. Viscosity should be 45 to 65 seconds at 100° F on a Saybolt Universal Viscosimeter. Flash point should be above 270° F.

Your local Alcoa sales engineer will gladly answer your questions about coolant practice, alloy selection and machining. You'll find him listed under "Aluminum" in your classified phone book.

ALUMINUM COMPANY OF AMERICA 870-L Gulf Building • Pittsburgh 19, Pennsylvania



ALCOA OFFERS TWO BOOKS—Alcoa Aluminum in Automatic Screw Machines—a 95-page book containing information on tool design, setup and operating techniques.

Corrected Tool Diameter Tables—a 64-page book giving corrected tool diameters for circular form tools and flat form tools under conditions of 0° , 5° and 10° top rake.

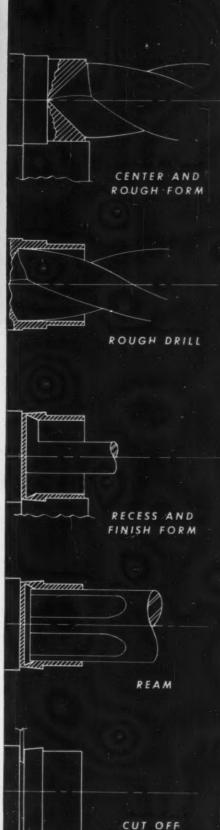




ALUMINUM SCREW MACHINE STOCK



"SEE IT NOW" with Edward R. Murrow—CBS-TV every Sunday . . . brings the world to your armchair. Consult your newspaper for local time and channel.





The right Republic Steel Saved

40% IN COST ...

3 OPERATIONS ...

3 INSPECTIONS...

AND BIG HEADACHE

Here's another case where Republic Carbon-Corrected Bar Stock replaced a carburizing steel.

Before they switched to Republic Carbon-Corrected Steel Bar Stock for automobile fan shafts, Schwitzer-Cummins Company had been carburizing the steel shafts after machining. This ran up costs, created the headache of carburizing and inspecting, tempering and inspecting, cleaning and inspecting, and finally straightening warped shafts and inspecting.

The Schwitzer-Cummins metallurgist called on our Republic 3-Dimension Metallurgical team ... the Field Metallurgist, backed up at home by the Laboratory and Mill Metallurgists. The decision was made to change over to Republic Carbon-Corrected AISI-C 1144 Bars. Now, induction hardening and inspection takes the place of the previous 8-step procedure. No warped shafts to straighten, and a better fan shaft that will last longer in your car or truck. Cost is reduced up to 40%.

The help our Republic 3-Dimension Metallurgical Service gave to Schwitzer-Cummins metallurgists is also available to you. It can help you make better products at lower cost, When shall we call?

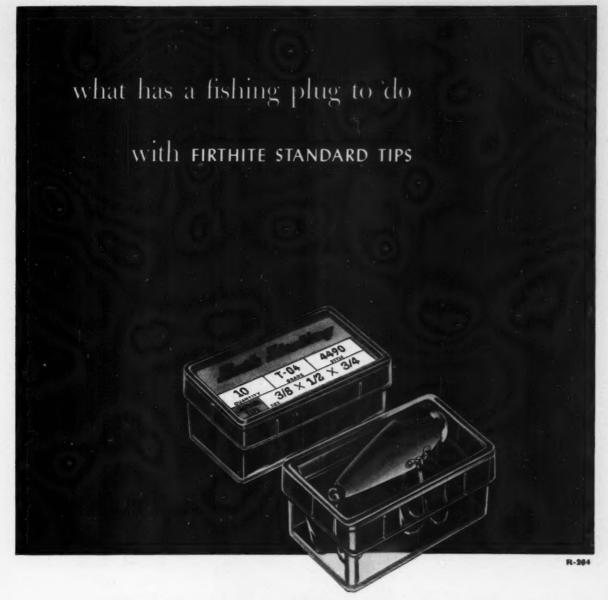
REPUBLIC STEEL CORPORATION

Alloy Steel Division • Massillon, Ohio
GENERAL OFFICES • CLEVELAND 1, OHIO
Export Department: Chrysler Building, New York 17, N. Y.





Other Republic Products include Carbon and Stainless Stoels—Sheets, Strip, Plates, Pipe, Bars, Wire, Pig Iron, Bolts and Nuts, Tubing



When a good fisherman buys a quality plug, it is usually contained in a plastic case so that he can easily store, identify, and protect the beauty. The same packaging technique has just been adopted by Firth Sterling, Inc. for its high quality Standard Carbide Tips. Now Firthite Tips are being delivered to you in plastic containers specifically designed for ease in handling, convenience in stocking, simplicity in identifying, and protection in storing.



This and other innovations in modern packaging are just a part of a new merchandising program by Firth Sterling which is centered on the creation of an entirely new Central Commodity Store Room for more efficient service to you.



OFFICES* AND WAREHOUSES: HARTFORD NEW YORK* DETROIT CLEVELAND DAYTON* PITTSBURGH* CHICAGO BIRMINGHAM* LOS ANGELES PHILADELPHIA*



GENERAL OFFICES: 3113 FORBES ST., PITTSBURGH 30, PA.

MACHINERY, November, 1952-107



Cut Costs of Your Stretch Forming and Low-Pressure Molding Dies with Alcoa Aluminum

Tool and Jig Plate*

- >> Moderately priced
- >> Strain relieved—machined both sides.
- >> Tolerances on plates of thicknesses from ½" to 4" held to within ± .010".
- >> Cut to any desired dimensions up to 48" x 96". Immediate delivery.

*For more information on Alcoa Tool and Jig Plate, contact your local Alcoa sales office...or write ALUMINUM COMPANY OF AMERICA, 1951-I Gulf Building, Pittsburgh 19, Pa.

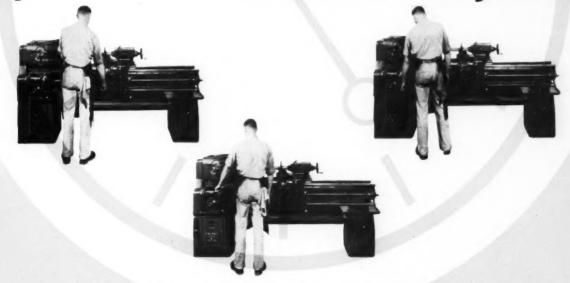
ALCOA



TOOL AND JIG PLATE



up to the minute: over the years





Cincinnati Tray-Tops offer the only complete line of modern design, light-duty, all geared head engine lathes that combine real economy prices with "high-priced" lathe features:

12 spindle speeds in geometric progression with an all-geared transmission—direct reading, three lever, color-match speed selector—spindle mounted in 3 precision bearings—totally enclosed quick change gear box—flame hardened transmission gears—ground bedways (flame hardened at small extra cost)—and many other top quality construction details.

The unique "Tray-Top" parking spaces (for tools, etc.,) typify the time and motion-saving conveniences that pay off in better work and more of it...

Engine, toolroom, and gap models. Swing sizes: 10", 12½", 15", and 18". Write for Catalog T-108.

Cincinnati Lathe & Tool Co., Cincinnati 9, Ohio



14" 3888 SLIDING HEAD FLOOR DRILL



18" 3988 SLIDING HEAD FLOOR DRILL

If the bulk of your drilling operations calls for 11/2" OD or less, check with your nearby Cincinnati dealer before you buy any equipment. The complete line he'll display ranges from 16"

Royal bench drills through 3' arm 7" column radial machines. See for yourself the sturdy construc-



a complete line:



21" SLIDING HEAD BOX COLUMN FLOOR DRILL



16" ROYAL BENCH DRILL

Your operators will appreciate
the unique Cincinnati tilting
motor bracket which makes belt
shifting quick and easy without
wrenches or squeezed fingers. It's
standard on all V-belt driven models.
Best buy for fixture work is the Cincinnati 3' arm 7" column radial designed to
fill the gap between large radials and upright equipment. Shops all over the coun-

CANEDY-OTTO DIVISION

Cincinnati Lathe & Tool Co.

tion that puts "Cincinnatis" second to none in accuracy, dependability and convenience. Discover how, by omitting frills and by using advanced manufacturing techniques in one of this country's most modern plants, we can provide you with quality machines promptly, at economy prices.



21" SLIDING HEAD ROUND COLUMN FLOOR DRILL



18" ROYAL FLOOR DRILL

Cincinnati drilling machines



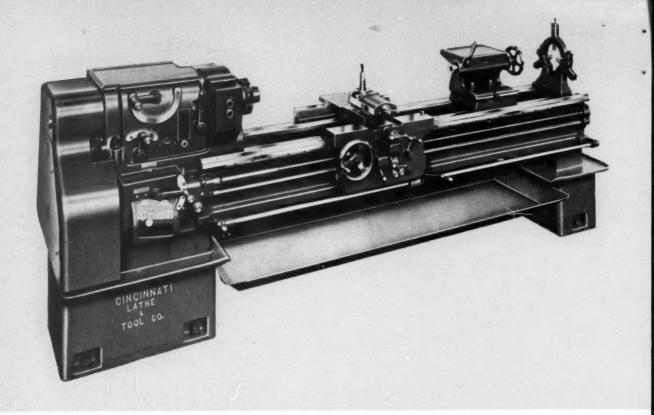
18" ROYAL BENCH DRILL

try tell us this machine breaks
bottlenecks by freeing big radials for large work, conserves
floor space, handles easily, and produces a high return on a relatively
low investment. For 90% of your drilling requirements you'll be right On
Center with "Cincinnati." Bench, floor,
and multi-spindle models available.
Write for the name of your nearest dealer.

Cincinnati 9 Ohio U.S.A.



3' ARM 7" COLUMN RADIAL DRILL



cincinnati model LT lathes

For a minimum investment, the new Cincinnati Model LT medium-duty engine and gap lathes give you round-the-clock dependability, handling the vast bulk of lathe work in maintenance and repair shops, general machine shops, and manufacturing plants. Their straightforward, simple design, ease of operation, and precision construction, make them a first consideration on any medium-duty lathe purchase. Write for Catalog S-102.

modern machine designs by staff engineers

Cincinnati Lathe & Tool Co. maintains a continuing product design and development program, with complete engineering facilities, to provide constant improvements in machine performance. That's why Cincinnati Lathes and Drills will always be up-to-the-minute—over the years.



Cincinnati Lathe & Tool Co., Cincinnati 9, Ohio, U.S.A.

PRINTED IN U. S. A

With

Automatic Cycle Control this Grinder



BESLY-BOWEN

ara Multi-Purpose Face Grinders an include models 3 horse power to 30 horse power, all available with Automatic Cycle Control

elbows on the gasket faces flat within .002" at a rate of 1 per hour. Both rotary tables are fixtured to accommodate a units per load. Materials cast iron, Surface Ground: Langle face, Stock Removal: .005"-.010", Accuracy: flat within .00 —surface finish 25-30 micro-inch R. M. S.

BESLY-BOWEN No. 707-12" FACE GRINDER

Precision control and uniform repetition of the feed cycle make the Besly-Bowen Grinder a glutton for production because there's no idle machine time.

Two rotary work tables allow the operator to unload, clean and reload at one table while the machine is grinding another setup on the alternate table. An exclusive Besly-Bowen feature, the automatically-controlled grinding cycle results in uniform dimensional control with a definite "step up" in production output.

If your product demands precision-finished surfaces in quantity—there's a Besly Grinder to do the job. Besly Grinders are readily adaptable to a wide variety of specialized work. And Besly Engineers are ready to help you select the right unit for your particular need. The coupon below will bring you detailed information.

BESLY

BESLY GRINDERS and ACCESSORIES BESLY TAPS, DRILLS, REAMERS BESLY-TITAN ABRASIVE WHEELS BESLY - WELLES CORPORATION

COMPANY

Established as Charles H. Besly & Company in 1875

112 Dearborn Avenue, Beloit, Wisconsin

Besty-Welles Corporation 112 Dearborn Ave.

- Please send us Besty Disc Grinder Booklet with de tailed story of Besty-Bower
- ☐ Also have a representative

NAME

ADDRESS

etive CITY____ZONE__STATE____

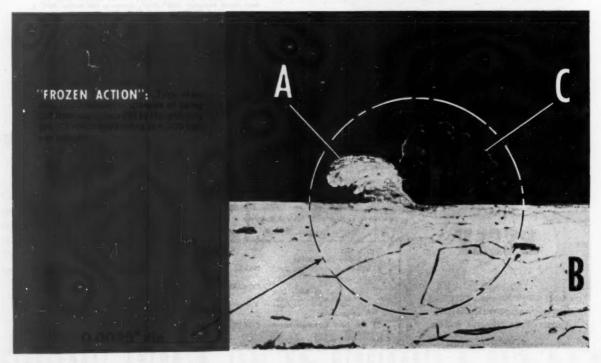
POSITION

Basic new concept by world's leader in machine tools led to CINCINNATI Grinding Wheels

FRANK RECOGNITION of the grinding wheel as a cutting tool has led to a new approach in Cincinnati Grinding Wheels. Through 25 years of research in chip formation, Cincinnati Milling has proved that the grinding process is a true metal cutting

process. The grinding grits do not abrade or wear away the surface of a workpiece but form chips which agree in classification with the basic chip types found in other metal cutting processes.

This new concept is the beginning of a

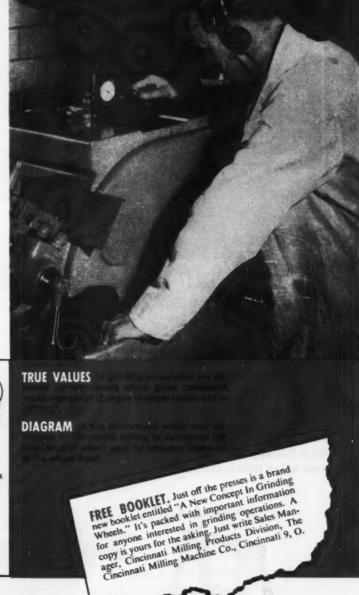


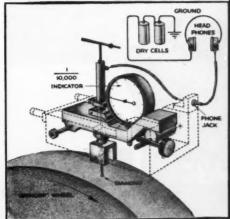
110-MACHINERY, November, 1952

whole new approach to grinding wheels the development of the grinding wheel as a true cutting tool. And it is a development you might expect from Cincinnati Milling, with the world's largest background of research and experience in metal cutting operations.

For you, this means grinding wheels developed and tested over a period of several years on the basis of true function—as true cutting tools forming true chips.

Available to you is a field organization of trained machinists who know grinding and grinding machines as well as grinding wheels. For a demonstration on your own machines of how to get the most out of Cincinnati Grinding Wheels, just write, wire or phone Cincinnati Milling Products Division, The Cincinnati Milling Machine Company.

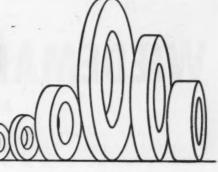






THE CINCINNATI MILLING MACHINE CO.

Cincinnati 9, Ohio



PIERCE THIS VARIETY OF SHAPES—AND MORE • without set up

this heavy duty turret punch press increases QUALITY at LOWER COST

Eliminate

- set up
- · excessive handling

• in sheetmetal or plate

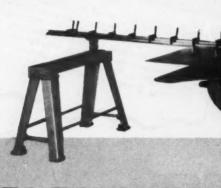
· with low cost tooling

· layout and other time-consuming methods

16 to 24 punches and dies in turrets for immediate use.

One machine completes most jobs.

Work locating gauge pierces accurate finished work in less than layout time.



WIEDEMANN

MACHINE COMPANY

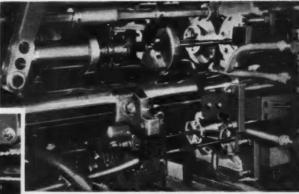
4205 Wissahickon Avenue . Philadelphia 32, Pa.

Although certain types of shaft jobs offer natural opportunity as bar machine work, with the exception of the CONOMATIC, seldom do they appear on multiple spindle bar automatics. In general, shaft jobs require a longer tooling area than do other types of bar work.

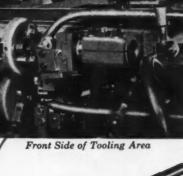
A glance at the frame design of the CONOMATIC explains why its tooling area is longer* than the tooling areas of other "automatics." And there are more tool positions* and more room* for tool setting for any type of job.

*You can have the figures

THERE'S MOTE THAN JUST "Elbow Room



Rear Side of Tooling Area



The length of the tooling area of the 1%-SIX, in which both of the above pieces were machined, is 43½ ins. from spindle nose to gear box wall. The tooling length of the main end slide is 26% ins., and the total length is 31% ins.

A Comparison of ALL Automatics is in favor of Cone



Conomatic | CONE AUTOMATIC | MACHINE COMPANY, INC. WINDSOR, VT., U.S.A.

MACHINERY, November, 1952-113



You consistently can depend on Philadelphia Gears to be good goars. The care they receive at every step of manufacture, from design through to the final inspection, makes certain they will meet your specifications.

Whether you need one gear or a thousand of any type, size or material, you get the benefits of specialized experience plus the most modern gear making facilities every time you order from "Phillie Gear."

For details about our complete line of gears - send for the Gear Catalog.

PHILLIE

Illustration shows precision cutting of 48". spiral bevel gear.

Dhiladelphia

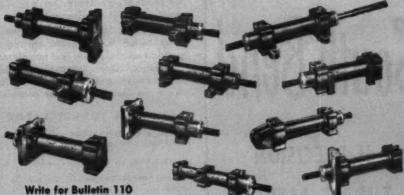
ERIE AVE. AND G ST., PHILADELPHIA 34, PA. NEW YORK . PITTSBURGH . CHICAGO . HOUSTON . LYNCHBURG, VA.

Industrial Gears and Speed Reducers LimiTorque Valve Controls

FOR YOUR

SERIES "N" HYDRAULIC CYLINDERS

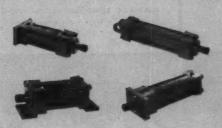
- Long recognized as the finest hydraulic cylinder made.
- No tie rods; ideal for long-stroke applications
- 12 bore sizes, I" to 8"
- Il mounting styles; many combination mountings available



HYDRAULIC

New HANNIFIN "Space Saver" HYDRAULIC CYLINDERS

- Here is a squaretype cylinder built to Hannifin's exacting standards
- Especially designed to meet the needs of machine tool builders



Write for Bulletin 111

Series SS—9 Bore Sizes, 1½" to 6" Four popular mounting styles, rugged construction, for pressures to 2,000 p.s.i.



Type U—Pressures to 1000 P.S.I. 1", 1½", 1½", 1½" Bores—Ideal for ilg and fixture work.

Write for Bulletin 112

CYLINDERS

HANNIFIN "CUSTOM" HYDRAULIC CYLINDERS

- Built in quantity for use on customers' products
- Specially designed for each application
- Often the most economical way to buy hydraulic cylinders



HANNIFIN

Hennifin Corporation, 1109 S. Kilbourn Ave., Chicago 24, III.

Air and Hydraulic Cylinders • Hydraulic Power Units • Pneumatic and Hydraulic Presses • Air Control Valves

South Bend

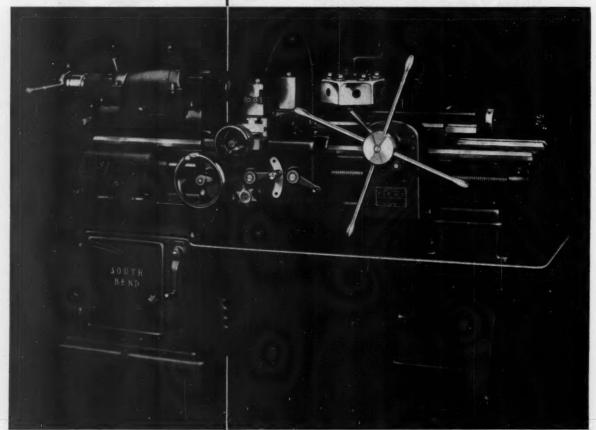
2-H PRECISION TURRET LATHE

This precision-built turret lathe is designed specifically for the rapid machining of accurate duplicate parts. It is especially suited for second operations that require close tolerances, smooth finishes and high productivity.

The exceptionally wide ranges of power cross feeds, power longitudinal feeds, thread cutting feeds and power turret feeds provide combinations that permit maximum cutting speeds through the entire machining cycle. Machine handling is fast and easy as excessive mass is not present in carriage and ram assemblies. Write for Catalog 67-F for complete information.

2-H TURRET LATHE SPECIFICATIONS

MAXIMUM COLLET CAPACITY 1" With handlever collet chuck.	R.H. or L.H0015" to .0841"
SPINDLE BORE 1%"	THREAD CUTTING FEEDS - 48 R. H. or L. H 4 to 224 per inch
spindle speeds—Twelve with 2-speed motor 20 to 945 r.p.m.	TURRET TO SPINDLE DISTANCES - Maximum with 6' bed 284'
SWING - over bed 161/4"	with 7' bed 40%'
over cross slide 6%"	TURRET TOOL FEED 61/4"
CROSS SLIDE FEEDS — 48 in or out	TURRET POWER FEEDS—96 reversible
CROSS SLIDE TRAVEL 9%"	TURRET DIAMETER 9%'
CARRIAGE LONGITUDINAL TRAVEL -	Detween mats.
6' bed 221/1"	TURRET TOOL HOLES dia. 11/2'
7' bed 341/4"	center to top of slides 21/2'





SOUTH BEND LATHE WORKS

BUILDING BETTER TOOLS SINCE 1906 425 EAST MADISON STREET, SOUTH BEND 22, INDIANA

UNION TWIST DRILLS



There's a

UNION

twist drill for top performance on every job!

Whether you're working on the hardest alloy steel or softest iron... on such non-ferrous metals as brass, copper, aluminum, magnesium or zinc... on slate, marble, rubber, plastics, wood or any other non-metal... there's a type of Union Twist drill that will give you tops in accurate, trouble-free, money-saving performance.

That goes, too, for a normal working pace or for high production records . . . and for every type of drilling equipment. No matter what the material or the conditions, you're sure of best results when you specify Union!



We own and operate S. W. CARD MANUFACTURING CO. Division, Mansfield, Mass.
Taps, Dies, Screw Plates...

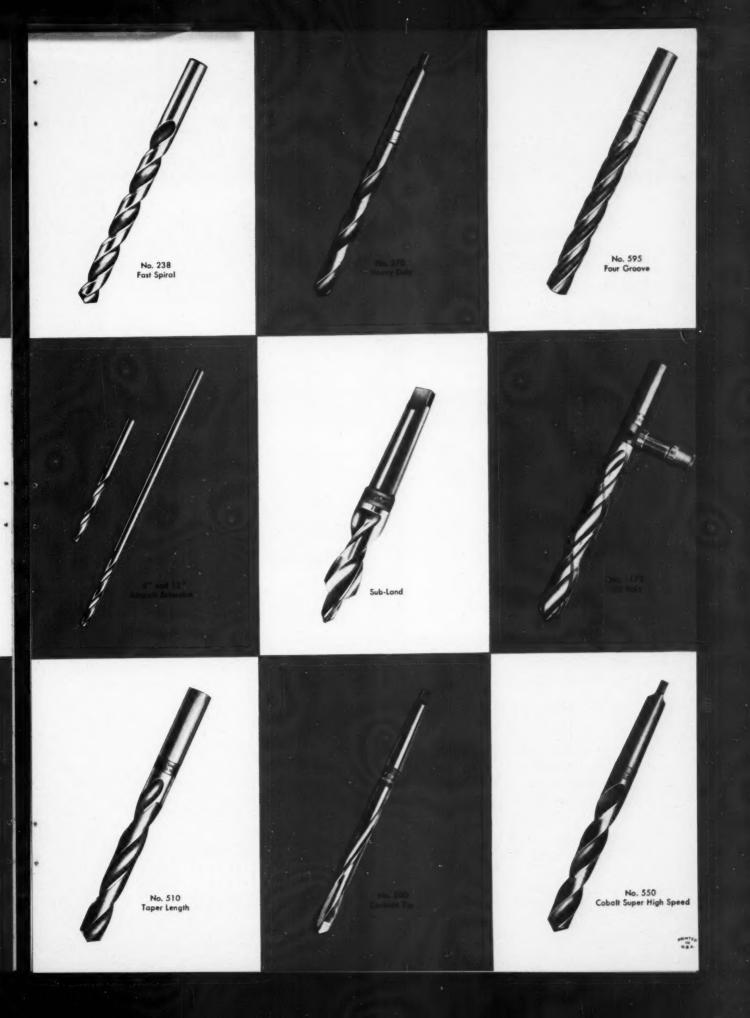
BUTTERFIELD DIVISION, Derby Line, Vt., Taps, Dies, Screw Plates, Reamers,
Twist Drills . . .

BUTTERFIELD DIVISION, Rock Island, Que., Milling Cutters, Twist Drills, Hobs Reamers, Taps, Dies, Screw Plates

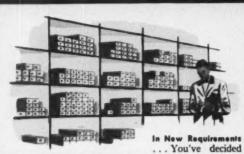








...and here's how your MAN distributor's teamwork pays off for you



on a type of twist drill you've never used before. Can you get quick delivery from your Union Distributor? You sure can! It's part of his job to keep complete stocks to meet your every need in cutting tools.



about the types of drills to use on a job that's new to you. Ask your Union Distributor! Chances are, the job is familiar to him. He's in constant touch with the latest in cutting tool practice. You can trust him to steer you right.



"soon" but right away — in order to avoid a production stoppage. Don't worry — you'll get them! Your Union Distributor is ready to deliver any emergency order, at any time.



production snag — say, a new material that resists every tool Conlact your Union Distributor! He'll call

you've tried. Contact your Union Distributor! He'll call in a Union Factory Representative—bringing you the expert technical aid that has licked some of industry's toughest cutting tool problems.

He's on YOUR Team, too

Your Union Distributor is a valuable co-worker in many ways. Acting as your "warehouse," he eliminates the trouble, space and expense of keeping big inventories in your plant. Through him, the Union factory with all its facilities becomes your next-door neighbor. Take advantage of his helpful teamwork that, day in and day out, saves you time, labor and money.

First team in cutting tools...

and your LOCAL DISTRIBUTOR

UNION TWIST DRILL COMPANY, ATHOL, MASSACHUSETTS



"Tycol Amulkut is the cutting oil for me . . . it really prolongs tool life"



That's 100% correct! Tycol Amulkut Cutting Oil speeds up production by permitting freer, faster cutting . . . assures uniformly finer finishes. It also cuts cost by reducing spoilage, and prolonging tool life . . . regrindings are few and far between.

Tycol Amulkut is readily emulsified, and is specially designed for use in this form...it is available in grades for normal and heavy-duty cutting.

For more information, call your nearest Tide Water Associated office.

TYCOL

Boston • Charlotte, N. C. • Pittsburgh Philadelphia • Chicago • Detroit Tulsa • Cleveland • San Francisco



SEND FOR A FREE COPY OF "TIDE WATER ASSOCIATED LUBRICANIA"

MACHINERY, November, 1952-121

JONES & LAMSON GUARANTEES CLASS III THREADS with REPETITIVE ACCURACY!

J&L Automatic Opening Die Heads are sold with this guarantee: that your threads will be held consistently within the exacting Class III tolerances for form, lead and pitch diameter, throughout the long life of the J&L chasers.

Some of the reasons why:

GIVES MAXIMUM SUPPORT TO THE CHASERS. J & L Dies are made of solid steel, no built-up sections, hardened and precision ground throughout. Chasers are supported at the point of, and in the direction of, maximum strain.

THREAD FORM, HELIX, PRECISION POINT HEIGHT, ARE ALL GROUND INTO CHASERS AFTER HARDENING.

This gives you a freer cutting tool, operating with minimum wear and repetitive Class III accuracy. The high precision of the J & L chasers is maintained in the Die by exclusive chaser holding features.

EASY, CONTROLLED RESHARPEN-ING. J & L chasers are resharpened independently of the holders or dies. Instructions are simple, easy to follow. Eliminates guesswork. Exclusive holding features assure accurate resetting.



RADIAL CHASER

Capacities from #8 to 4%"

TANGENT CHASER TYPES

Stationary and Revolving. Capacities from #4 to 2" Only J&L Die Heads and Chasers give you ALL these features. Write to Dept. 710 for illustrated catalogs and complete information.

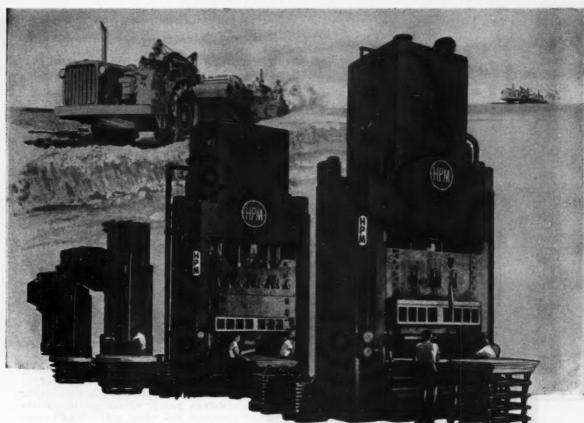
JONES & LAMSON

Machine Tool Craftsmen
Since 1835

JONES & LAMSON MACHINE CO., Springfield, Vt., U.S. A.

DIE HEAD DIVISION

122-MACHINERY, November, 1952



Diversification of Parts Prod

F PARTS PRODUCTION AT CATERPILLAR ...

CALLS FOR H-P-MS

The diversification Caterpillar Tractor Co. enjoys in the field is equally important on the Caterpillar production line . . . and, that's where H-P-M all-hydraulic, Fastraverse presses show their flexibility.

Caterpillar production men call on versatile H-P-M presses to perform a wide variety of jobs in the building of Caterpillar's extensive line of powerful tractors, engines, motor graders and

rugged earth-moving equipment. Presses in this diversified production line of H-P-M's range in size from 500-ton to 3500-ton models . . . and, one press may do work on as many as 15 or 20 different parts.

Diversification backed by specialization is an important plus-value factor that Caterpillar machines and

allied equipment and H-P-M presses have in common. Caterpillar produces a diversified line and it has a single goal . . . that of supplying heavyduty prime movers and attachments to industry in hundreds of earth-moving, agricultural, marine and other basic power applications. H-P-M, too, has a single goal . . . that of supplying all-hydraulic, Fastraverse presses for virtually every pressure processing application . . . presses that

are backed by the accumulated experience of more than 75 years in which H-P-M has specialized in one field only—hydraulics.

Whatever your production problem, you'll benefit by the specialized experience of H-P-M. Invite us in at the planning stage, won't you?



THE HY 1042 MARION ROAD M F G . C O M P A N Y
MOUNT GILEAD, OHIO, U.S.A.

Builders of Presses for the Metal Working & Processing Industries * Plastics Molding Presses * Die Casting Machines * Hydraulic Pumps, Valves & Power Units

MACHINERY, November, 1952-123





T-P VERNIER FINE-FEED ATTACHMENTS

make precision settings faster, easier. Read to .0001". Installed on either horizontal or vertical feeds on new or old model T-P Surface Grinders.



give finer finishes and greater precision. Unique ball bearing construction minimizes end-thrust and radial-play . . . increase wheel-life and loading capacity. ¾ hp., 3600 rpm. motor is sealed and lubricated for life.



T-P ANGLE AND RADIUS WHEEL DRESSERS Angle Wheel Dresser shown simplifies form-

grinding of angles. Base is graduated 90° on either side of center. Radius Wheel Dresser, also available, for grinding contours with small surface grinders.



dresses to thinnest possible proportions safely and accurately. Graduated dial mounting permits precise adjustment of two diamond points. Useful for grinding narrow slots in form tools, gages, etc.



T-P WHEEL BALANCING STAND

indicates balance of mounted wheels with great accuracy. Three leveling screws permit precise adjustment of leveling surfaces. For wheels up to



T-P SINE SETTING SLEEVE

is 21/2" cylindrical sine bar. Fits over tapered end of wheel spindle in place of grinding wheel. Speeds accurate setting of tilting spindle.



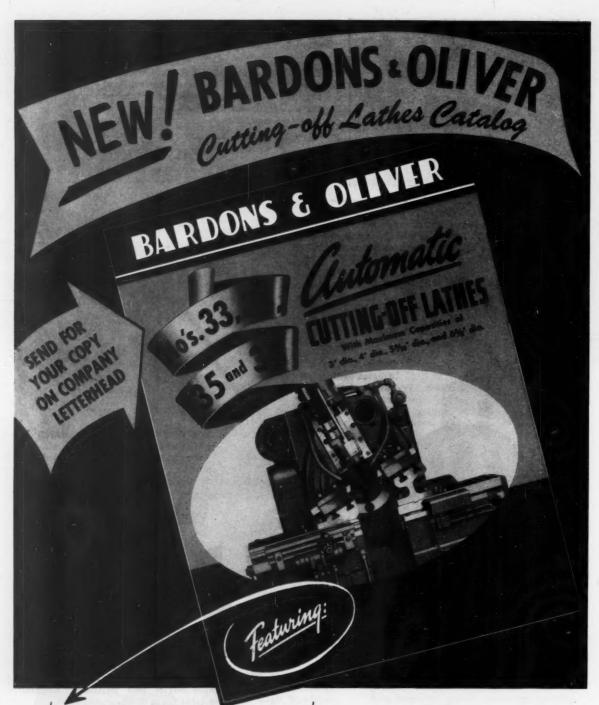
THIMBLE provides a quick, accurate way to balance grinding wheels up to 8" diameter, 1" face, and 11/4" hole. Simply adjust two balancing collars. Available from stock.



For the complete story on these items and many more, get your copy of the New Taft-Peirce Handbook, just off the press.



MANUFACTURING TAFT-PEIRCE COMPANY





√ Rapid Speed Changes through Sliding Gears combined with Reversible Pickoff Gears. Camless Hydraulic Feed to Double Tool Slides.

DF

H0

TO EF C HAP RRA DTF

RIN

IDE IPPE IPPE IN OUT A TENT D RE RET RE

ENER D METERS OF ORN

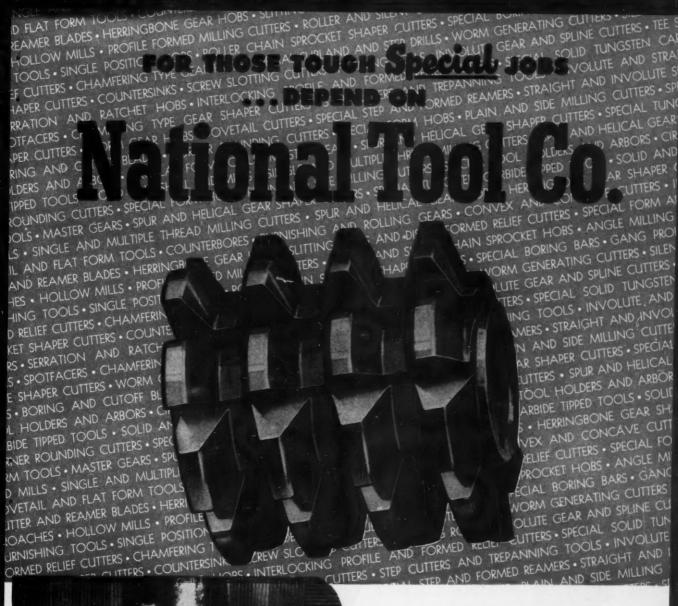
Ample power to use either Roller Cutters or Carbide Cutoff Blades to full capacity.

BARDONS & OLIVER, Inc.

.

1135 WEST 9TH STREET

CLEVELAND 13, OHIO





• Years of successful experience in special tooling and related production problems are yours for the asking. When the job requires special cutting tools call in your National Tool Co. representative. He is backed by more than 46 years experience in the engineering and manufacture of special cutting tools. His assistance is yours, without obligation, whether you're interested in one tool or a complete tooling program.

Since 1905 engineers and manufacturers of high-quality special cutting tools for the metal-working industry

National
TOOL CO.
Cleveland 2, Ohio

Now . . . Seams Reduced to

ABSOLUTE MINIMUM

on these NEW AO Gloves!





AO 514 ASBESTOS GLOVE

Yes, for workers' comfort...for savings for our customers, we've redesigned our asbestos glove line to eliminate seams wherever possible. By reducing seams from 8 to 3, there's not only greater working ease for the user but longer work life for the glove.

MAKE THIS COMPARISON TEST!

Look at any conventional asbestos glove. Note the vertical seams that extend to the cuff. Note the seams that secure gauntlet to glove. Now check against the large photograph here. You'll see the seams on the thumb and only ONE SEAM extending the length of the glove (on the back). Note also the absence of horizontal seams—(thus assuring a stronger glove and longer life which means valuable savings).



AO 2514 Glove with asbestos-reinforced palm.



QUICK FACTS:

- Finest grade specially treated asbestos, recommended for extreme heat.
- · Yarn is closely woven.
- Double stitched for long service.

AO's Industrial Vision Program increases production, decreases accidents. Write taday for free booklet "Improved Industrial Vision" to 1113 Vision Park, Southbridge, Massachusetts.



SOUTHBRIDGE, MASSACHUSETTS • BRANCHES IN PRINCIPAL CITIES

Specify

ECONOMY
LONG LIFE
BETTER FINISH
GREATER ACCURACY

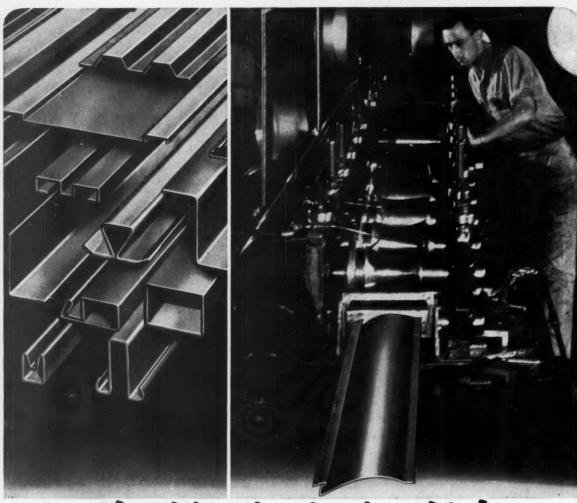
When the reamer becomes dull, it may be put back into its original serviceable condition not once, but many times, by expanding and resharpening.

Telephone Your Industrial Supply Distributor

THE CLEVELAND TWIST DRILL CO.

1242 East 49th Street • Cleveland 14, Ohio

Stockrooms: New York 7 · Detroit 2 · Chicago 6 · Dallas 2 · San Francisco 5 · Los Angeles S8 E. P. Barrus, Ltd., London W. 3, England DISTRIBUTORS EVERYWHERE are ready to serve you!



Metal Lumber by the Mile!

Not only rough but finished "lumber," mouldings and trim, are made in an endless stream on a Yoder Cold Roll Forming machine, from coiled metal strip.

The photo shows the production of siding by Kaiser Aluminum and Chemical Corporation, Oakland, Calif. The strip goes in at one end, is perforated and formed, coming out at the other as finished siding, automatically cut to length, ready for installation.

As a matter of fact, almost anything that can be made from lumber can now be made more accurately, better and more cheaply from metal, by this method. Plain steel angles, channels and Z's up to ½" thick, take the place of conventional framing lumber. More intricate shapes, combining structural strength with decorative value, serve for mouldings, panels and trim.

Billions of feet are now made annually on Yoder machines, owned by manufacturers of buildings and their components, furniture, electric appliances, automotive equipment, etc.

Yoder book on the function, scope and economics of Cold Roll Forming, sent on request. Consultations and estimates for the asking.

THE YODER COMPANY • 5504 Walworth Ave., Cleveland 2, Ohio

Complete Production Lines

- * COLD-ROLL-FORMING and auxiliary machinery
- * GANG SLITTING LINES for Coils and Sheets
- * PIPE and TUBE MILLS-cold forming and welding



MCCROSKY

COST CUTTING TOOLS



MCCROSKY

Universal Line

MILLING CUTTERS

This new design, with the blade and wedge on radial center in the alloy steel body, provides space for 4 times as many blades as the cutter diameter, if extremely fine pitch is desired. Required hand and cutting angle is secured simply by inserting blades of proper design for the rotation desired and metal being cut. Thus, just one body is required for either left or right hand rotation, milling iron, steel or aluminum with carbide. Easy, accurate blade adjustment. Highly economical for long or short runs. Write for Bulletin.



MCCROSKY

Jack - Lock

MILLING CUTTERS

Face Mills, Shank and Shell End Mills, Half Side and Staggered Tooth Milling Cutters fitted with high speed steel, cast alloy or carbide tipped blades. Sizes from 3" to 24" in diameter to meet any requirement. McCrosky's nationally famous Jack-Lock and Super-Jack wedges permit the blades to be locked rigidly and unlocked easily and quickly without hammering the blades or cutter body. This assures fine, highly accurate blade adjustment, and regrinding with min loss of blade stock. Write for Bulletin No. 17-M.



MCCROSKY

Super Adjustable

REAMERS

Complete line includes chucking ream ers with straight or tapered shanks, shell reamers with tapered holes for standard arbors or large straight holes for line bar reaming. Stock sizes from 15/16" to 6" diameter. High speed, cast alloy or carbide tipped blades. Widely endorsed shop proved pin and screw blade locking device holds the blades rigidly, preventing chatter and producing con-centric holes with high finish, yet permits easy release of the blades and accurate adjustment to compensate for wear. This permits the blades to be re-ground and re-used many times before re necessary. Write for Bulletin 17-R.

MCCROSKY Block Type BORING BARS

Exclusive, patented, tapered and hardened V-key centers the cutter block accurately and rigidly, yet permits easy release for regrinding, and "floating" with extreme accuracy whe ng cuts. High speed, cast alloy or carbide tipped blades. Straight tapered shank designs, with or without pilots. Write for Bulletin 17-8.



MCCROSKY

Turret

TOOL POSTS

These tool posts permit successive tools to be swung into cutting position quickly, indexed accurately, and locked rigidity, giving engine lathes many of the advantages of turnel lathes. Four styles—I I sizes for mounting in the T-slot of the cothe bolt circle of the main slide. Write for Bulletin 17-17.

MCCROSKY Wizard

QUICK CHANGE CHUCKS

McCrosky's Wizard quick-change chuck and collet outfits hold tools centered and rigid. They enable the operator to change tools easily and quickly, without stopping or slowing down the spindle. Thus successive operation jobs become continuous, increasing production and cutting costs. Wide range of sizes and applications. Write for Bulletin 18-C.





McCrosky "Specials" combine two or more related boring, facing, chamfering or reaming operations into a single tool—do them all simultaneously—with just one tool,—and one set-up,—saving time and cutting costs. Engineered by McCrosky to your work prints. Write for Bulletin 17-5.



TOOL CORPORATION MEADVILLE, PA.

Engineering and Sales Representatives in the Principal Cities

CUTTING 20 GAGE and 5/8 PLATE SIDE-BY-SIDE AT ONE STROKE

Photograph shows operators cutting % plate and 20 gage sheet steel simultaneously on NIAGARA Power Squaring Shear. No change in knife adjustment is necessary.

The ability of Niagara Power Squaring Shears to cut thick and thin plate both at the same time with the same knife setting is a dramatic demonstration.

Visitors at our plant can see this done every day.

There is no necessity for tinkering with the knife adjustment.

Demonstrates The Sound Engineering Design POWER SQUARING SHEARS

• There is no compromise with sound, proven engineering when it comes to NIAGARA shear design and construction.

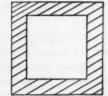
Accurate cutting depends primarily on rigidity of the shear's components.

For bed, crosshead and holddown NIAGARA uses CLOSED BOX SECTIONS to resist with minimum deflection the horizontal, vertical and diagonal or torsional loads to which every shear is subjected.

NO OTHER SECTION WILL DO THIS JOB AS EFFICIENTLY.

Angle or channel shaped sections have long since been abandoned for use on NIAGARA Power Shears.

The economy of quality is remembered long after price is forgotten.





BED, CROSSHEAD & HOLDDOWN DESIGN

DISTRICT OFFICES: DETROIT, CLEVELAND, NEW YORK



PHOTOS BY COURTESY OF THE UNIVERSAL DRAFTING MACHINE CORPORATION

By holding spindles absolutely rigid and keeping motion friction-free, Fafnir Ball Bearings contribute much to the vernier accuracy and effortless action of the Universal "Boardmaster". The ultimate results are more accurate sketches, layouts or detailing and "on the nose" template work in faster time . . . so important when good engineers and draftsmen are scarce.

At three pivot points, pairs of extra-light, compact single row, Fafnir Ball Bearings give finger touch ease of movement without a trace of play. At the "centralized control unit", a large diameter Fafnir Bearing is used together with paired, preloaded and pre-lubricated Fafnirs. Six of the seven Fafnir Bearings used are Plya-Seal Type, which prevent lubricant leakage, keep out contaminants, and are lubricated for life.

The faculty for providing custom-made types of bearings out of stock... from the most complete line in America... makes Fafnir the first source consulted by leading manufacturers. Maybe you can solve bearing problems this easy way. The Fafnir Bearing Company, New Britain, Conn.



Standard Rodial



Wide Inner Ring Ball Bearings



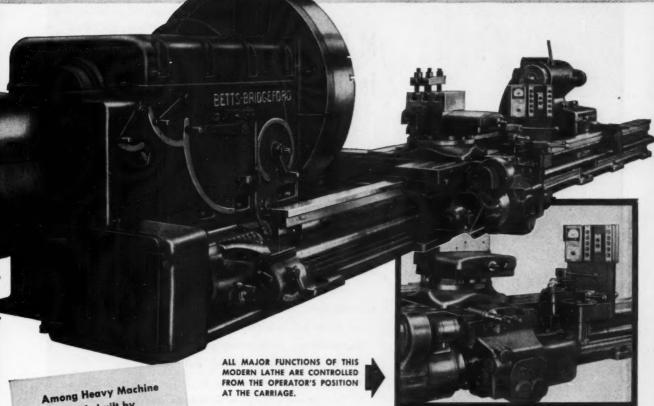
Hya-Seal Type Bearings



BETTS-BRIDGEFORD

ELECTRONIC FEED

60" HEAVY DUTY LATHE



Among Heavy Machine
Tools built by
Consolidated are

LATHES
BORING MILLS
DRILL PRESSES
MILLING MACHINES
BORING MACHINES
COLD SAW MACHINES
BORING, DRILLING AND
MILLING MACHINES
DRILL AND TOOL
GRINDERS
PLANERS
SLOTTERS
RAILROAD SHOP TOOLS
AND OTHER
SPECIAL MACHINES

- Wide speed range permits use of either high speed steel or carbide tools.
- Feed and traverse functions entirely independent of thread cutting mechanism.
- Feed rate and cutting speed, within the range of their respective motors, are adjustable independently without interrupting the cut.
- Lead screw for thread cutting only.
- · All anti-friction bearing headstock.
- Hardened steel bedways.
- Main drive motor speeds and feed and traverse functions are conveniently controlled from the operator's position at the carriage.
- Altogether, this modern lathe embodies the advanced features necessary to meet today's demand by Industry for high production with greater accuracy and durability. Full information on this lathe or other Betts-Bridgeford Heavy Duty Lathes from 26" to 144" and larger will be furnished upon request.

BUILDERS OF HEAVY DUTY MACHINE TOOLS SINCE 1848

BETTS · BETTS BRIDGEFORD · COLBURN · HILLES & JONES · MODERN · NEWTON · SELLERS



CONSOLIDATED
MACHINE TOOL CORPORATION

SUBSIDIARY OF FARREL-BIRMINGHAM COMPANY, INCORPORATED

ROCHESTER, NEW YORK

SMALL BEARING CONES

21119

FLAT SEALING SURFACES

OIL WELL PUMP

MICROHONING is in MOIIT

GEARS

DIESEL ENGINES

ONTROLS

future

REFRIGERATOR COMPRESSORS

AIRCRAFT ENGINES

HYDRAULIC CONTROLS

GUN BARRELS

TRACTOR PARTS

AUTOMOTIVE ENGINES

If your operation requires the generation of accurate cylindrical or flat surfaces.

Hundreds of industrial plants have found that Microhoning not only improves the quality of the surface, but also increases production—reduces scrap, handling, and inspection costs.

No, you do not need a crystal ball.

The potentials of the Microhoning process can best be judged by the past accomplishments and present policy of the organization that developed it.

To give industry a complete service, the Micromatic Hone Corporation has an organization and sales policy unique in the machine-tool business. One well-coordinated organization sells, engineers, builds, and services the complete installation. Micromatic assumes full responsibility for all the equipment and the results obtained with the Microhaning process.



MICROMATIC HONE CORPORATION

MICROMATIC HONE CORP. MICRO-MOLD MFG. DIV. Besten Pest Road

> MICROMATIC HONE CORP. 1323 S. Sonte Fe Avenue Les Angeles 21, Colifornia

MICROMATIC NONE CORP. 614 Empire Building 26 So. Main Streat MICROMATIC HONE CORP. MICRO-MOLD MFG. DIV. 231 Se. Pendleton Avenue. Pendleton, Indiane

MICROMATIC HONE LTD. 55 George Street Brentford, Ontorio, Conada

REPRESENTATIVES: OVERGARD MACHINE TOOL COMPANY, 234 Commonwoolih Bidg., Denver 2, Colorado
NALLIDIE MACHINERY CO., 2726 First Are., South, South, Wash. • REPRESENTATIVES IN ALL PRINCIPAL COUNTRIES

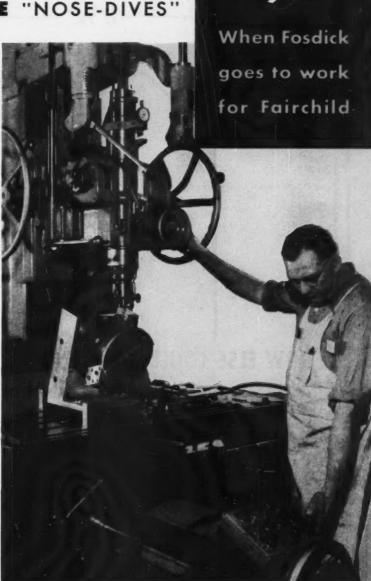
COMFORT "FLIES HIGH"

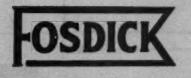
BORING TIME "NOSE-DIVES"

In safety high above North Atlantic storms... breathe in "living-room" comfort at 25,000 feet — thanks to the cabin pressurizer made by Fairchild Engine and Airplane Corporation. Mass production of the precision magnesium housing unit for commercial and military cabin superchargers demanded speed and unerring accuracy. That's why Fairchild installed Fosdick Automatic Positioning Machines for drilling, facing and boring 31/32" holes to a depth of 1.670". Result? Accuracy to ± .0001"... boring time slashed 40% over previous methods.

"And equally important," says Assistant Plant Manager C. E. Luhman of Fairchild's Stratos Division, "is the phenomenal flexibility of the Fosdick Automatic Positioning Machine. It's simple to interrupt production—run through 5 or 6 pieces for an experimental unit—and then return to production with an absolute minimum of down time."

If, like Fairchild, you need exact reproduction of drilled, bored and tapped parts—plus quick changeover from one job to another—with holes located to tolerances as close as ± .0001"—investigate the Fosdick Automatic Positioning Machine today. It will actually pay for itself many times over through savings in man hours, set-up time, materials and jig storage space. Call your Fosdick Distributor today or write for Bulletin APM.



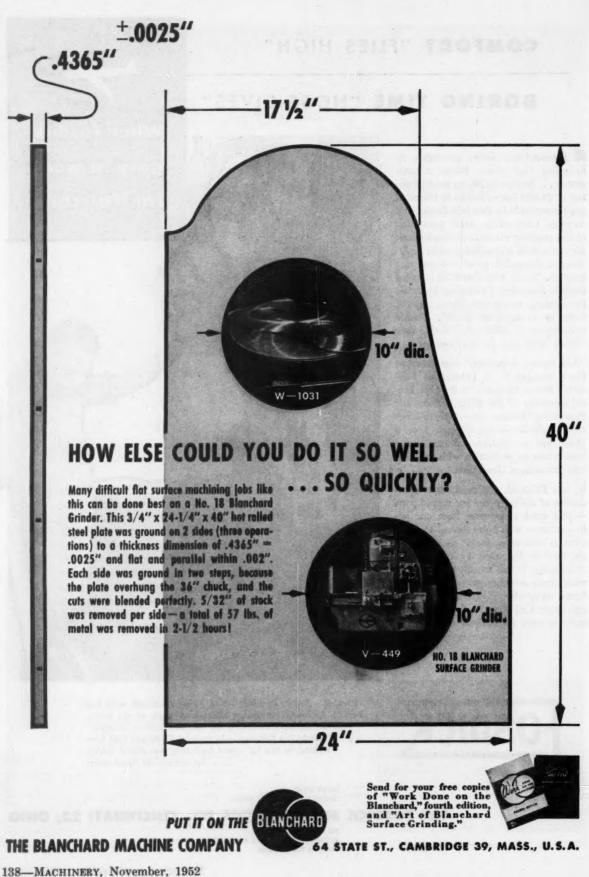


Fairchild's Stratos Division slashed boring time 40% with this Fosdick Automatic Positioning Machine. A touch of the button positions the work electrically for each new hole to ± .0001" center line tolerance—in seconds! Costly jigs have been replaced by two 3/8" square duplicating bars drilled quickly for the job and stored easily.

RADIAL DRILLS SENSITIVE AND UPRIGHT DRILLS

THE FOSDICK MACHINE TOOL CO., CINCINNATI 23, OHIO

ING BORRIS AUTOMATIC POSITIONING MACHINES SENSITIVE RADIAL DIBLIS



Threadwell fine cutting tools



THREADWELL TAP & DIE CO. Greenfield, Mass., U. S. A.



TAP DRILL SIZES and BASIC THREAD DIMENSIONS

NOMINAL SIZE	MAJOR DIAM. INCHES (BASIC)	PITCH DIAM. INCHES (BASIC)	ROOT DIAM. INCHES (BASIC)	COML. TAP DRILL TO PRODUCE APPROX. 75% FULL THREAD	OF TAP DRILL	MACHINE SCREW NO.	MAJOR DIAM. INCHES (BASIC)	PITCH DIAM. INCHES (BASIC)	ROOT DIAM. INCHES (BASIC)	COML. TAP DRILL TO PRODUCE APPROX. 75% FULL THREAD	DECIMAL EQUIV. OF TAP DRILL
1/4-20 1/4-28	.2500 .2500	.2175 .2268	.1850 .2036	7 3	.2010 .2130	0-80	.0600	.0519	.0438	364	.0469
5/16−18 5/16−24	.3125 .3125	.2764 .2854	.2403 .2584	F	.2570 .2720	1-64 1-72	.0730 .0730	.0629 .0640	.0527 .0550	53 53	.0595 .0595
%-16 %-24	.3750 .3750	.3344	.2938	\$/16 Q	.3125 .3320	2-56 2-64	.0860	.0744	.0628 .0657	50 50	.0700
%6-14 %6-20	.4375 .4375	.3911	.3447 .3726	U 25/64	.3680 .3906	3-48 3-56	.0990	.0855 .0874	.0719 .0758	47 45	.0785 .0820
1/2-13 1/2-20	.5000 .5000	.4500 .4675	.4001 .4351	27/64 29/64	.4219 .4531	4-40 4-48	.1120 .1120	.0958 .0985	.0795 .0849	43 42	.0890 .0935
%4-12 %6-18	.5625 .5625	.5084 .5264	.4542 .4903	31/64 33/64	.4844 .5156	5-40 5-44	.1250 .1250	.1088 .1102	.0925 .0955	38 37	.1015
5%−11 5%−18	.6250 .6250	.5660 .5889	.5069 .5528	17/ ₃₂ 37/ ₆₄	.5312 .5781	6-32 6-40	.1380 .1380	.1177 .1218	.0974 .1055	36 33	.1065 .1130
3/4-10 3/4-16	.7500 .7500	.6850 .7094	.6201 .6688	21/32 11/16	.6562 .6875	8-32 8-36	.1640 .1640	.1437 .1460	.1234 .1279	29 29	.1360 .1360
7/8-9 7/8-14	.8750 .8750	.8028 .8286	.7307 .7822	49/64 13/16	.7656 .8125	10-24 10-32	.1900	.1629 .1697	.1359 .1494	25 21	.1495 .1590
1 - 8	1.0000 1.0000	.9188 .9536	.8376 .9072	7/8 15/16	.8750 .9375	12-24 12-28	.2160 .2160	.1889 .1928	.1619 .1696	16 14	.1770 .1820
1½-7 1½-12	1.1-250 1.1250	1.0322 1.0709	.9394 1.0168	6364 1 364	.9844 1.0469	14-20 14-24	.2420	.2095 .2149	.1770 .1879	10 7	.1935 .2010
1¼-7 1¼-12	1.2500 1.2500	1.1 <i>57</i> 2 1.1959	1.0644 1.1418	1 %4 111/64	1.1094 1.1719						
1%-6 1%-12	1.3750 1.3750	1.2667 1.3209	1.1585 1.2668	1 7/ ₃₂ 1 1 1/ ₆₄	1.2187 1.2969	+					
1½-6 1½-12	1.5000 1.5000	1.3917 1.4459	1.2835 1.3918	111/32 127/64	1.3437 1.4219						

Threadwell

Threadwell Tools do many jobs

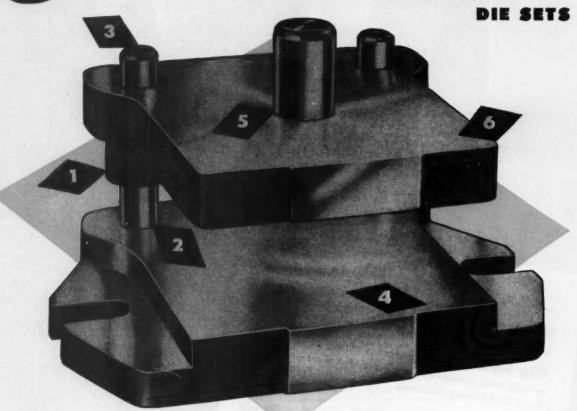


they can do y<u>our</u> tough ones

THREADWELL TAP & DIE CO. Greenfield, Mass., U. S. A.



reasons for buying..PRODUCTO



- 1. Bushings have an absolutely uniform inside diameter, resulting in full-bearing and extra long life.
- 2. New design die set gives added strength and assures accurate location of pin and bushing holes.
- 3. Accuracy of guide pins and bushings are checked on light guages reading to 50 millionths of an inch.
- 4. Parallelism and flatness held to close limits by rough machining prior to grinding.
- 5. Shank, cast as integral part of semi-steel die set, can be inserted or welded on all-steel sets.

 Surface plates, accurate to within .0001", check flatness of ground surfaces and parallelism of die set.

To make an accurate die, an accurate die set must be used. For this reason, every Producto die set is an instrument of precision.

If planning a new die today, order your die set by the new Producto catalog — selection is easy, delivery is prompt.

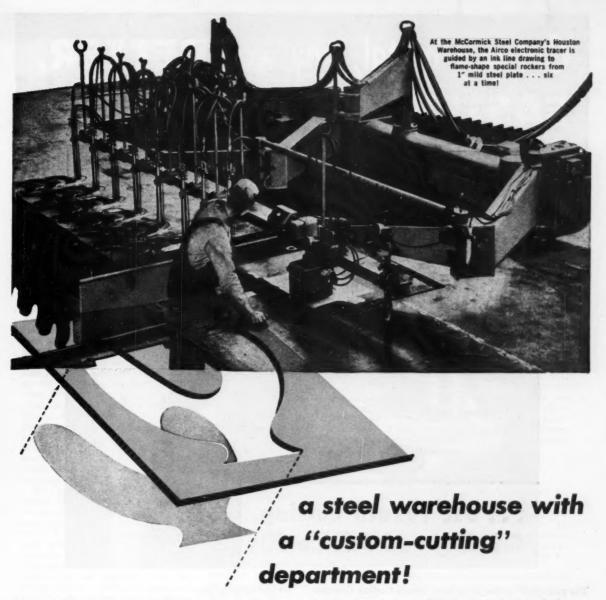
THE PRODUCTO MACHINE COMPANY 985 Housetonic Ave., Bridgeport 1, Connecticut

For Precision Die Sets Fast Call



ALSO MAKERS OF DIE ACCESSORIES, FEEDING EQUIPMENT, VISES, MACHINERY.

142-MACHINERY, November, 1952



That's McCormick Steel of Houston, Texas! By installing an Airco No. 50 multi-torch cutting machine, they've boosted steel orders with an entirely new type of service . . .

Here's how it works: customers supply an outline drawing or paper cutout of the required part. An "electronic eye" traces the guide with hairline accuracy. Irregular shapes, inside and outside square corners, obtuse angles, slim slots and intricate contours — the

Airco No. 50 Travograph takes 'em all in stride. Circles up to 12 feet in diameter — thicknesses up to 6 inches! By keeping all 8 torches in operation, McCormick mass produces intricate shapes so accurately that further machining is, in most cases, unnecessary.

The Airco No. 50 Travograph cuts light plates, heavy slabs, billets or forgings... to minute tolerances... with virtually no limit on shape or size. Complete details are available by contacting your nearest Airco office.



MANY PRINCIPAL CITIES

AIR REDUCTION

AIR REDUCTION SALES COMPANY - AIR REDUCTION MAGNOLIA COMPANY - AIR REDUCTION PACIFIC COMPANY REPRESENTED INTERNATIONALLY BY AIRCO COMPANY INTERNATIONAL

DIVISIONS OF AIR REDUCTION COMPANY, INCORPORATED

at the frontiers of progress you'll find



Cut any metal, any way BETTER, FASTER, AT LOWER COST



The examples* below show how Texaco Cutting Coolants — backed by the know-how of Texaco Lubrication Engineers — can help you do all your machining —

BETTER — On this drilling job, a .040" hole had to be reamed and held to plus or minus .0002". Change from a competitive oil to *Texaco Cleartex Cutting Oil* reduced rejects 30%.

FASTER — In the production of a slotted part on a Davenport 5-spindle automatic, the better cooling and lubrication provided by the recommended Texaco Cutting Fluid resulted in an increase of 875 pieces per 8-hour shift.

AT LOWER COST - Reduction in downtime, after switching to Texaco Sultex Cutting Oil, saved \$245 a month -

on just one machine.

Similarly, where machines are hydraulically operated or controlled, you can reduce costs and assure increased production by using *Texaco Regal Oil (R&O)* as your hydraulic medium. It's turbine-quality – specially fortified and processed to prevent sludge, rust and foam.

Let a Texaco Lubrication Engineer, specializing in metal working, help you step up production and reduce your machining costs. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York 17, N. Y.

*Names and details on request

TEXACO CUTTING, GRINDING AND SOLUBLE OILS MACHASTER



TUNE IN: Tuesday nights on television—the TEXACO STAR THEATER starring MILTON BERLE. See newspaper for time and station

144-MACHINERY, November, 1952



Defense Agencies Looking to New Congress

ONE of the tougher problems faced by industry today in "keeping up with Washington" is the rapid turnover of defense agency personnel at the level of decision. It is becoming increasingly difficult to locate men who have the power to say yes or no. Finding any who have the desire to do so is even more difficult.

In some ways, the defense agency men appear preoccupied. Those on loan from industry-themselves anxious to get back to their own companies-find it doubly difficult to take action when their career colleagues seem to be marking time. As for the career people, many of them are youngsters whose nowplush jobs were spawned by World War II, and nurtured by Korea. Understandably, such employes are as much concerned with what their fate is to be after June 30, 1953, as they are with industry's views about machine tools, controlled materials, or business economics.

Most of today's decisions in Washington are being made with an eye to the new Congress, and what it may think or do. Self-preservation is the first law of government agencies, just as it is of nature. The agencies are doing their level best to prove they can use present powers judiciously and sparingly, thus entitling them to additional powers far into the dim future, over materials and money, compensation and prices.

What the production planners want, so they say, is continued authority to regulate "if necessary"—such authority to be used only in the direst of emergencies. In the next breath they point out that "some" immediate planning will be necessary, "for example, in the machine tool industry."

For Better Or Worse

So for better or for worse, unless Congress lets the controls authority of the National Production Authority expire on June 30 as per schedule, the machine tool industry appears in line for continued bolstering.

The current export situation, for example, finds domestic producers barred in part from foreign markets by metals restrictions and priorities. Meanwhile, overseas producers not only move into the resulting vacuum in the international market, but ship important volume into this country. Until 1950, imports of machine tools added up to only a couple of million dollars a year. In 1951, the total was \$14,000,000, and it has been estimated that the 1952 total will be around \$50,000,000.

Meanwhile, exports this year are not expected to exceed \$50,000,000—just half of the total shipments for 1947. So it appears that foreign producers have picked up \$50,000,000 in overseas business, and approximately \$48,000,000 inside the U. S. This year, when total shipments will be valued at approximately a billion dollars—about three times pre-Korea—the \$98,000,000 loss to foreign producers may not be too significant. What it might mean when, if, and as things return to "normal" is quite another question.

"Improvement" Forecast

In so far as the defense program is concerned, the National Production Authority is telling advisory committees that the tight machine tool picture will be eased by next March or April. Although some machine tools are still in scant supply, NPA reported that orders are beginning to drop off. There is to be a steppedup demand, however, for jet-engine broaches in the next six months. NPA has estimated that the broach cutting tool industry is capable of producing about \$45,000,000 worth of products, as compared with \$3,895,-000 reported for 1951. The industry is reported to be operating at about 57 per cent of capacity.

Further "improvement" was indicated in NPA's report that its inventory center has now listed 30,000 government-owned machine tools having a value of about \$450,000,000 at current replacement costs. The inventory includes tools which the government did not dispose of after World War II, and which have been lying idle in storage depots, navy yards, arsenals, and warehouses.

Since last May the inventory center has leased 2117 pieces of equipment to military and defense-supporting contractors. The items leased have a replacement value of \$29,730,000. NPA is urging more contractors to take advantage of the availability of these government tools. On hand are general, single, and special-purpose machines. Included are boring machines, diesinking machines, drilling machines, gear-cutting machines, lathes, milling machines, and shapers.

"For the first time," commented Ralph S. Howe, director of NPA's Metal-working Equipment Division, "detailed information has been gathered and indexed to describe tools scattered in storage spots all over the country. Many of these tools can be modernized, or with some improvisation, can be put to immediate use." Those interested in the inventory should contact PECIG (Production Equipment Central Inventory Group), Washington 25, D. C.

Small Business Expansion Goals

The parting report prepared for publication by Telford Taylor, retiring administrator of the Small Defense Plants Administration, included a draft of an amendment which would increase SDPA's authority to obtain defense contracts for smaller firms.

Mr. Taylor explained that Secretary of Defense Lovett "has shown little or no enthusiasm" for the small defense plant program written into the Defense Production Act by Congress. "SDPA's power to effect the awarding process is limited to persuasion," observed Mr. Taylor. He urged that the agency's authority be broadened.

SDPA has announced the small business share of the industrial expansion goals for machine tools, cutting tools, and dies, jigs, and fixtures. For the machine tool expansion goal of \$125.000,000, the small business share is 30 per cent, and for cutting tools, their share is 49 per cent of the \$30,000,000 goal. Of the \$33,-000,000 expansion goal for dies, jigs, and fixtures, the small business share is 49 per cent. Manufacturers desiring to participate in these expansion goals are being urged to file applications for certificates of necessity at the nearest field office of the National Production Authority.



Collet Work — The right machine for collet work of one-inch or less diameter.



Step Chuck Work — For rapid and accurate holding of tubing, castings, moldings, stampings and machined parts. Capacity to 6".



Jaw Chuck Work—Integral mount, universal or independent, for extra accuracy. Capacity to 5".



Face Plate Work — 9" slotted and tapped face plate for holding irregular shapes.



HIGH SPEED PRECISION LATHE

Correct Size - High Speed - Precision Results



The above three important requirements for proper lathe work in tool rooms, production departments, or laboratories are completely fulfilled by the new Hardinge DV59 High Speed Precision Lathe.

Correct size of the machine in relation to work saves loss from under-capacity production on larger lathes. High spindle speeds, up to 4000 r.p.m., permit full capacity cutting and ex-

cellent finish. Sustained accuracy and ease of operation assure precision results.

Send for Free illustrated Bulletin DV 59



HARDINGE BROTHERS, INC., Elmira, N. Y.

146-MACHINERY, November, 1952

Regardless of Election Results

WHEN this issue of MACHINERY reaches our readers, the election will be a thing of the past and there will no longer be any conjecture as to whether the national administration for the next four years will be Republican or Democratic. Regardless of which party has won and whether Dwight Eisenhower or Adlai Stevenson will occupy the White House, it is to be hoped that consideration will be given toward changing the annual depreciation rates allowable on capital equipment such as machine tools.

It is no secret that manufacturing equipment in the metal-working industries is reaching an age and degree of obsolescence that are not conducive to increased productivity. In fact, surveys seem to indicate that the highest point of obsolescence in modern industrial history has been attained.

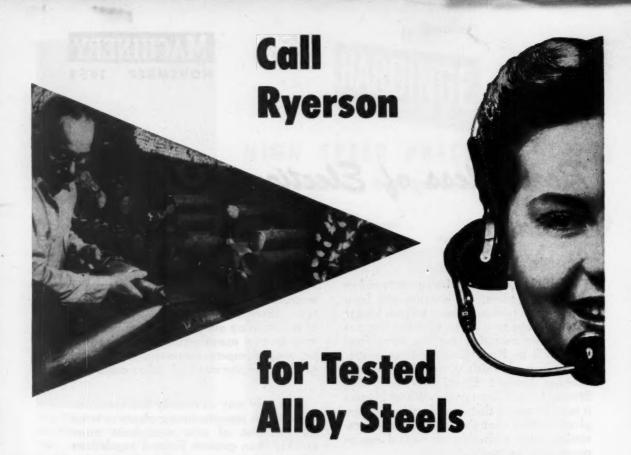
Many complaints have been made to government agencies to the effect that small factories have not been receiving a proportionate share of defense orders. The truth is that most of the smaller plants do not have good enough equipment to produce aircraft parts and other essential defense items within the prescribed dimensional and quality tolerances.

Vital as this obsolescence situation may seem from the standpoint of national defense, there is also the important problem of maintaining our production superiority over foreign manufacturers in order that we may compete successfully in world markets despite our high labor costs.

The only way to remedy this condition is to permit manufacturing plants to write off the cost of new equipment more quickly than present Federal regulations allow. With present slow depreciation rates, most business concerns simply cannot afford to keep their manufacturing plants up-to-date with equipment capable of turning out quality products at minimum costs.

Our government officials still have not learned the one worthwhile page from Hitler's book—vast depreciation allowances make a strong industrial nation. Hitler permitted German manufacturers to write off new equipment within five years, and their industry was developed to the point where Germany could defy practically the rest of the world on fields of battle. American industry should be given the opportunity of applying the same economic principle toward the constructive goal of world peace.

Charles O. Herb



TOOL STEEL FROM RYERSON Easier to Buy . . . Safer to Use

Steel procurement is trouble enough these days without adding unnecessary steps. That's one reason why many shops are ordering tool steel from Ryerson, their regular warehouse steel source. And with every shipment of Ryerson tool steel you get exact instructions on how to harden. Water, oil and air hardening types in stock—also ground flat stock.

Today, when Government restrictions are enforcing the use of leaner alloys with unfamiliar heat treatment response, you'll find Ryerson Alloy Service more helpful than ever. The tests we make to assure quality, verify analysis and guide your heat treating are your best protection against production difficulties, costly breakdowns.

For example, we spark test our alloy stocks to guard against mixed steels. And we put every heat of Ryerson as rolled and annealed alloy through four separate hardenability tests. The result: positive hardenability knowledge of the particular steel shipped to you.

All test information—hardenability, analysis, etc.—is carefully recorded on a Ryerson Alloy Certificate delivered with your steel as a guide to heat treatment. So don't take today's alloys for granted. Order from Ryerson by hardenability as well as analysis—and be doubly sure.

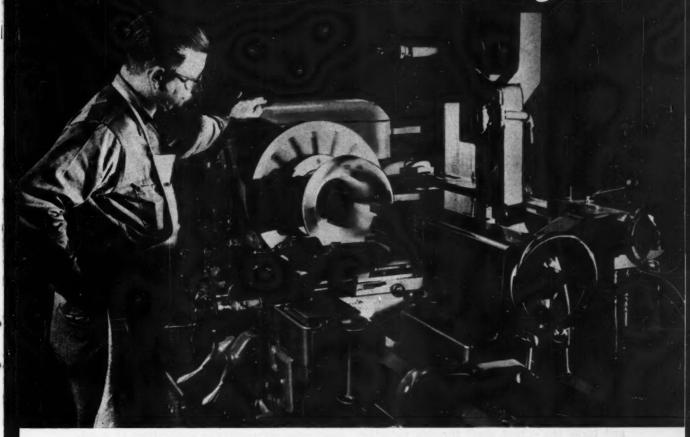
Stocks include low, medium, and high carbon alloys in all finishes and conditions.

PRINCIPAL PRODUCTS: CARBON, ALLOY & STAINLESS STEELS...BARS, STRUCTURALS, PLATES, SHEETS, TUBING, ETC.

RYERSON STEEL

JOSEPH T. RYERSON & SON, INC. PLANTS AT: NEW YORK . BOSTON . PHILADELPHIA . CINCINNATI . CLEVELAND . DETROIT
PITTSBURGH . BUFFALO . CHICAGO . MILWAUKEE . ST. LOUIS . LOS ANGELES . SAN FRANCISCO . SPOKANE . SEATTLE

Boeing Produces Small Turbo-Jet Engines



SPECIAL machine shop equipped with standard machine tools is turning out a 175-H.P. gas-turbine engine at the Boeing Airplane Co., Seattle, Wash. The engine, identified as Model 502, weighs only one-tenth as much as a Diesel engine of comparable horse-power, and can operate on fuel oil, kerosene, or gasoline. It requires less space than a household washing machine, and contains approximately 400 parts. (There are 881 different parts in an automotive gasoline piston engine, and 1400 parts in a Diesel engine.) Proposed applications of the "502" are as a power source in light aircraft, helicopters, air compressors, generators, trucks, small boats, and pumps.

Boeing entered the small gas-turbine engine

business indirectly. Originally, company engineers were mainly concerned with design and operational aspects of jet-engine installations in large aircraft. Since the initial investigations turned out to be rather inconclusive, it was decided to construct various scale model arrangements of components for laboratory testing and analysis. Detailed data could then be related to larger engines. Work in this direction progressed to the point where a small, lightweight internal combustion gas-turbine type prime mover—the "502"—was evolved.

The engine consists of two principal sections—a gas producer section and a power output section. These sections are not mechanically connected, being tied together only aerodynamically.



Fig. 1. In this lathe, transverse and longitudinal cutter feed movements are automatically coordinated to follow a template contour.

The gas producer section is actually the jet engine, and consists of a compressor and a turbine wheel mounted on opposite ends of a common shaft. Air is supplied by the compressor and directed through two burners, where fuel is added and burned. The hot gas produced is then directed through a nozzle to the turbine wheel, and the energy removed from the gas in the turbine furnishes the power that drives the compressor. A second turbine, in the power output section, removes additional energy from the gas and turns the output shaft through reduction gears. Exhaust gas from the power output tur-

bine is expelled to the atmosphere through diffusers and ducts.

Many of the various machining operations required in building the new turbine are intricate and precise. Fortunately, development and production of the engine have come in an era in which machine tools have already reached a high degree of flexibility, automation, and speed. Compromises in part design ordinarily have not had to be made between the drawing-board and production line. The accompanying illustrations show some representative applications of standard machine tools in building the "502."

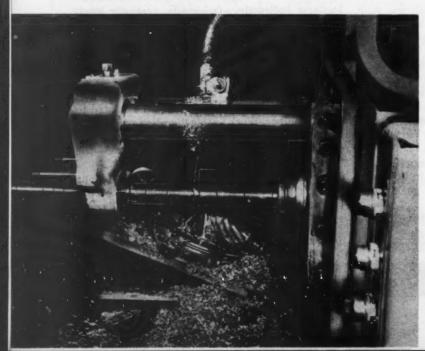
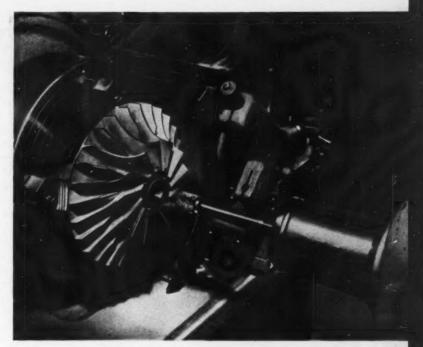


Fig. 2. The blades of the impeller are made by radially gashing a solid aluminum forging on a riseand-fall milling machine. Angle fixture produces proper blade pitch.

150-MACHINERY, November, 1952

Fig. 3. A chucking grinder is employed to finish the bore of the impeller. A four-jaw chuck supports the impeller body.



On the Monarch air-gage tracer lathe, Fig. 1, a case for a compressor is shown set up on a faceplate. A template employing a pneumatic principle establishes coordinate movements of the cross-slide and the 45-degree compound rest so that the cutter generates the desired contour. Another lathe contouring operation can be seen in the heading illustration. In this instance, a Lodge & Shipley lathe equipped with a "Copymatic" attachment is boring and forming the

flare on a bell-mouth air intake, the cutter automatically following a template.

The impeller for the gas producer section of the power plant has twenty-eight blades and half-blades, and is made from a solid aluminum forging on a Brown & Sharpe rise-and-fall milling machine, as shown in Fig. 2. The blades are formed by gashing the forging radially. After completion of each cut to depth, the table is automatically returned to an indexing position to

Fig. 4. A combination of reciprocating and rotary movements reproduces the cutter form in the pinion-gear blank in this gear shaping operation.



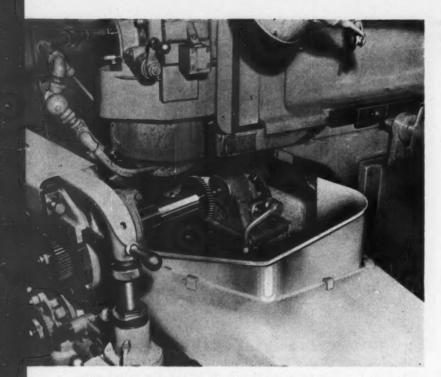


Fig. 5. The generating principle of this gear grinder is similar to that of the hobbing process.

Fig. 6. Through optical projection the slightest surface imperfection is readily detected by the inspector.



prepare for the next cut. The fixture supports the work at an angle that gives the blades the desired degree of pitch. A rotating feature of the fixture accurately indexes the work.

Another interesting operation on the impeller is illustrated in Fig. 3. Here, the bore of the impeller is being ground to size on a Bryant chucking grinder.

Facilities for manufacturing gears are, in many ways, the pride of the turbine project. Making gears for the turbine requires a particularly delicate touch, for they operate at speeds that are four to five times those of automotive gears. Small tolerances and close inspection are accordingly required to produce teeth that match perfectly and thus reduce wear. To obtain the necessary precision, gears are roughed out on a hobber or shaper, heat-treated, then finished on a gear grinder or gear shaver.

A gear shaping operation is seen in Fig. 4. The teeth of a pinion gear are being cut on a Fellows fine-pitch gear shaper. Fig. 5 shows the operation of finish-grinding a helical planet gear. This gear is used in the reduction unit of the power output section, and has a grinding tolerance of 0.0002 inch. The machine used is a standard Pratt & Whitney gear grinder.

A rigid quality check is maintained on all gears, both those made at Boeing and those supplied from an outside source. One machine checks the action of each gear by matching it with a master. Another runs a delicate finger along the contour of each tooth to determine its trueness to shape. A third machine, for helical gears, measures the lineal advance of each tooth per revolution of the gear. Results are recorded on tape, as a pen line, and even a speck of dirt on a tooth produces a decided bulge in the line. Further inspection, of a visual nature, can be made by projecting the gear profile on a wall, as in Fig. 6, where the tiniest of gears appears larger than a wagon wheel.

The making of the turbine wheel for the gas producer section and that for the power output section, called the first-stage turbine wheel and the second-stage turbine wheel, respectively, involves a number of precision grinding operations. The blades of these wheels are separate components and must be very carefully ground. In Fig. 7 is shown a set-up for grinding the scallops on the blades of a second-stage turbine wheel. Sixty-eight blades are handled simultaneously on this Gallmeyer & Livingston surface grinding machine.

A Heald rotary surface grinder is used to fin-

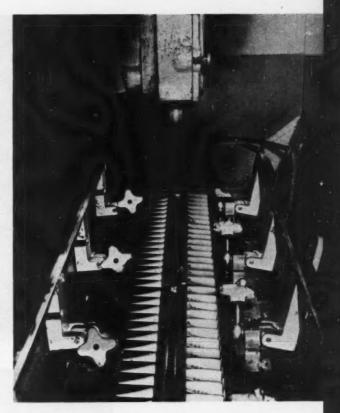


Fig. 7. Frame-like doors of this fixture are closed centrally during the actual grinding of the turbine blades.

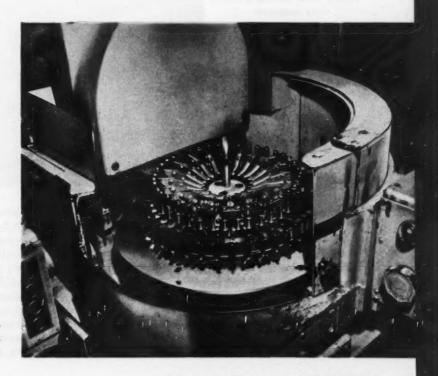


Fig. 8. Between 400 and 500 turbine-blade faces can be surfaceground in an eight-hour shift.

MACHINERY, November, 1952-153

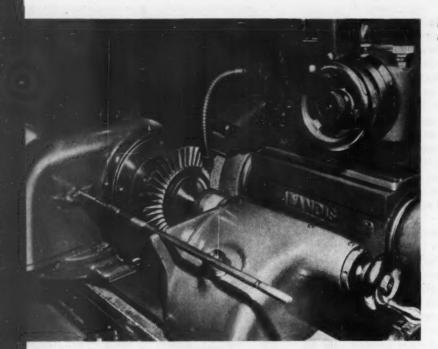
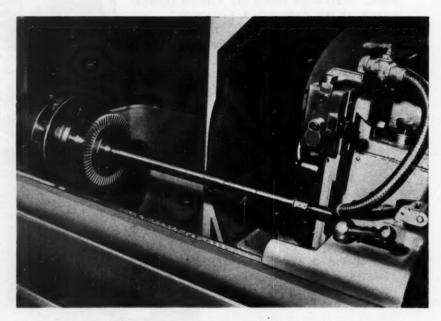


Fig. 9. A cylindrical grinder produces an accurate back face on this second-stage turbine wheel.

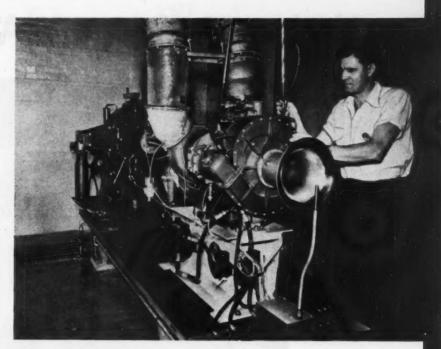
Fig. 10. Threaded end of shaft of the first-stage turbine wheel being produced on a thread grinding machine



ish the faces of the blades, as can be seen in Fig. 8. The quick-acting fixture used for the operation accommodates a batch of forty blades. For grinding the back face of the turbine wheels after the blades have been welded in position, a Landis cylindrical grinder is used, as shown in Fig. 9. And for grinding the thread on the compressor end of the first-stage turbine shaft, an Ex-Cell-O thread grinder, Fig. 10, is used.

Coincident with the development of the new power plant was the interest of the Navy's Bureau of Ships in gas turbines as prime movers for small craft. Because of the advanced state of the work completed by Boeing, the Bureau sponsored further development of the "502." Test engines were installed in several small boats. In addition, an engine was installed in a 10-ton tractor-trailer truck to gain test experience under varying conditions not readily obtained on a boat or observed on a dynamometer. Exhaustive testing has led to an engine of increased power and efficiency and greater struc-

Fig. 11. In this test cell, exhaust stacks direct the gases from the turbine out through the roof.



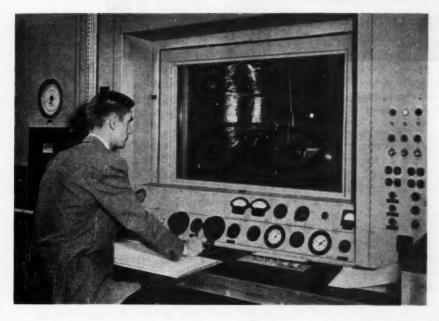


Fig. 12. Fourteen test cells enable every phase of the engine's performance to be examined, analyzed, and corrected.

tural reliability. Work in this respect has centered on compressor, diffuser, burner, nozzle, and turbine wheel blade design. Other work has been in improving the welding technique to secure the blades to the wheels, reducing vibration, experimenting with turbine wheels of different physical properties, improving engine starting in low-temperature service, and removing restrictions to the gas flow through the engine.

In Fig. 11 is shown an engine equipped with various types of recording apparatus in a test

cell at Boeing. A view of the engineer's station outside the window of one of the test cells can be seen in Fig. 12. For most purposes, more can be learned by observing the instrument panel outside the window than by watching the engine inside. Here, by means of gages and manometer tubes, the entire story of the "502's" performance under every conceivable test can be read and recorded. Next to the instrument panel is the control panel, with the push-buttons and switches for running the engine.

Underarm Support Aids Milling

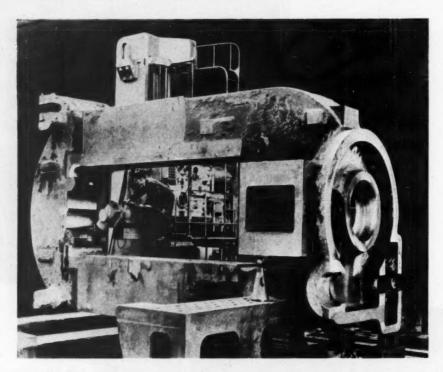


Fig. 1. A floor type horizontal boring machine has been equipped with an underarm support and angular milling attachment to simplify machining of "window" in rolling mill housing.

It is an advantage in machining large parts to have general-purpose equipment capable of performing numerous operations without resetting the work. The task of moving castings and weldments such as rolling mill housings, crushing mill components, press beds and crowns, etc.—sometimes weighing more than 100 tons—creates both unusual and difficult problems. These problems are multiplied when huge components must be moved from one machine to another and then accurately located and clamped for different operations.

Standard horizontal boring, drilling, and milling machines can be used to complete many operations parallel to the machine spindle. However, characteristics of the parts to be machined may require additional operations which must be performed at right angles to the machine spindle. To meet various machining requirements without resetting the work, a new underarm support has been adapted to the Giddings & Lewis horizontal boring machine headstock. The underarm has a reach of 60 inches from the headstock face, and will rigidly support the cutting tools for

heavy-duty milling and boring operations in the extended position.

There are two types of units that can be mounted on the underarm support. One is an anti-friction bearing block which holds the machine spindle. With this unit, different types of boring and milling cutters are placed on the outer end of the spindle, as well as such attachments as continuous-feed facing heads and star-feed facing heads.

The second unit that can be mounted on the underarm is an angular milling attachment. This is a geared unit with a take-off shaft that is keyed to, and driven by, the machine spindle. Either a right-angle milling head or an offset milling head is used with this unit, depending upon job requirements. The spindle support block and the angular milling head can be quickly and easily mounted on or removed from the underarm.

A huge four-high steel rolling mill housing weighing 138 tons is shown in Fig. 1 mounted on a floor type horizontal boring machine. The open structure of this machine simplifies setting

and Boring of Large Work

By DONALD M. LAFLIN
Giddings & Lewis Machine Tool Co.,
Fond du Lac, Wis.

the part prior to machining, for there are no interfering machine components to obstruct handling. With the housing mounted on its side, as shown, parallel to the machine runway, it is possible to mill and bore the inner surfaces of the "window" without difficulty or excessive handling. All necessary milling and boring operations to complete the "window" are made before the housing is reset.

The angular attachment is shown in the process of milling a lower angular surface. As soon as this "window" surface is completed, the machine operator will rotate the head to mill the upper angular surface. The finished milled surfaces seen between the two angular pads were completed by merely rotating the head. The machine spindle drives the cutter through gears in both the support and the angular milling head. Synchronized movement of the underarm with the spindle provides the necessary cross-feed. To mill the upper and lower side sections of the "window," the operator depends upon longitu-

dinal feed movement of the machine column on its runway. Both flatness and parallelism of all milled surfaces are held to close limits.

An unusual machining operation performed on this same casting is illustrated in Fig. 2. Here the underarm has been equipped with an offset milling head. Using this auxiliary attachment, it is possible to overcome the problems of clearance on the hard-to-reach inner top surface of the "window." It would be impossible to work within the space shown if this offset head were not used. The underarm rigidly supports the offset head throughout its cross travel. Then the cutting head is rotated 180 degrees to machine the lower surface. In this way, both surface parallelism and dimensional locations are easily and accurately held.

Only a few of the milling operations required to complete the "window" in this housing have been shown. There are many other operations needed before the casting is ready for assembly. For example, the over-all machining procedure

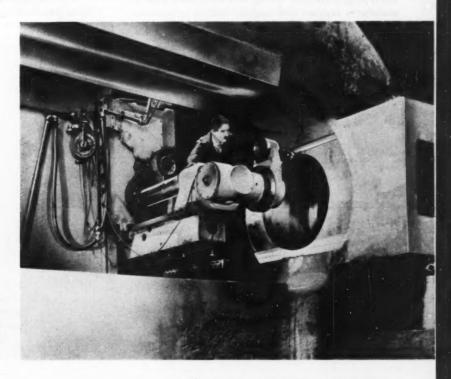


Fig. 2. Underarm support and an offset milling head are employed to machine the inner top surface of the 138-ton rolling mill housing—the same part shown in Fig. 1.

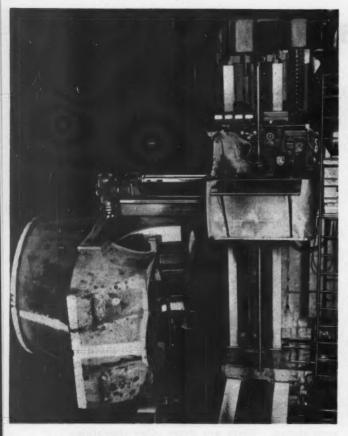


Fig. 3. Various surfaces on odd-shaped work-pieces can be machined without resetting the work by equipping horizontal boring mill headstock with an underarm support and angular milling attachment.

followed on a typical rolling mill housing requires three separate set-ups.

Typical operations performed in the first setup include rough- and finish-milling of various pads, and angular milling of the side, lower, and upper surfaces of the "window." The thirteen operations in this set-up are completed in twentyeight and one-half hours.

Milling, facing, slotting, and keyway cutting are included in the twenty-eight operations performed during the second set-up, and these operations are completed in about thirty-one and one-half hours. In the third and final set-up, requiring twenty-two more hours, various holes in the cast housing are rough-, semi-finish-, and finish-bored; counterbored; chamfered; and faced.

Machining of Odd-Shaped Work Facilitated by Underarm Support

The problems encountered in machining oddshaped work can be solved by using the underarm support as shown in Fig. 3. Ordinarily, several settings would be necessary to mill different surfaces on the lower half of this centrifugal exhauster housing. With the underarm support and an angular milling attachment, however, it is possible to reach various surfaces on the housing with ease. Then, instead of resetting the work, the milling head can be rotated and flats on either side of the steel casting machined.

The work-piece shown in Fig. 4 is a combination steel casting and weldment (20 3/4 feet long,

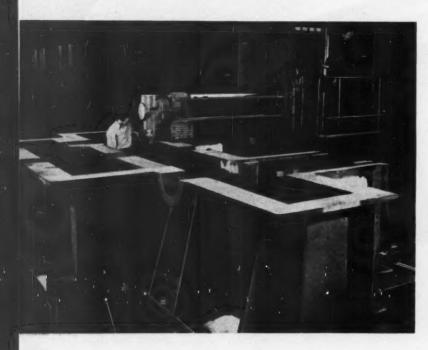


Fig. 4. Here the underarm support has been extended more than 60 inches to mill a locating keyway on a combination steel casting and weldment that is used as a drive and pinion housing for a crusher.

12 feet wide, and 5 1/2 feet high, weighing more than 38 1/2 tons) which forms an important drive and pinion housing for a large crusher. The underarm on the horizontal boring machine has been extended 60 inches to support the cutter as a locating keyway is milled in the part. This is but one of a series of major operations performed on the combination casting and weldment which have been speeded up through the use of the underarm.

The same large crusher component is shown in Fig. 5 after it has been turned over to perform several boring operations. It is necessary to bore half circles in both the front and back of the work-piece, and the underarm is moved into the opening to support the boring tool. The housing is completed on one Giddings & Lewis machine in 378 1/2 hours—a saving of 241 hours over the previous method requiring four machines.

The drive and pinion housing is laid out before it is taken to the machine, merely to determine whether the piece will clean up during machining. No further lay-out is necessary, since the scales and verniers on the machine are depended upon for locating critical dimensions. The allowable tolerances on machined surfaces, bores, counterbores, etc., are 0.002 to 0.003 inch. All bearing seats are precision bored to receive anti-friction bearings.

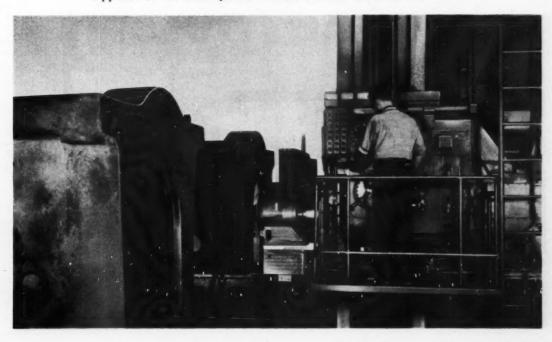
Through the use of the underarm support on

this horizontal boring machine, savings of approximately 40 per cent in machining time were made on the drive and pinion housing. Similar savings have been obtained in other types of work, especially on parts whose size and shape make them difficult to handle and position on the machine.

Complete records have been kept on thirty-two different parts-records which include the former method of machining, using several machine tools, and the present method, using the horizontal boring machine with underarm support. The work-pieces machined in each instance were either duplicates or parts similar enough to permit accurate comparison. The previous time for machining ranged from a high of fifty-eight hours for a pitman to three hours for a bottom cap. The time required for machining the thirty other work-pieces fell within this range. The time now required for similar work ranges from a high of thirty-six hours to a low of two and one-half hours, with the average time saved on the thirty-two individual pieces being 43 per cent. In addition to the savings in time, parts were machined more accurately because fewer set-ups were required. This resulted in easier final assembly, since excessive hand fitting and re-machining were eliminated.

The physical nature of many parts creates different machining problems. Fig. 6 shows a steel mill roll, which is difficult to handle because

Fig. 5. The crusher housing seen in Fig. 4 has been turned upside down for interrupted boring cuts. An anti-friction bearing block which supports the machine spindle has been mounted on the underarm.



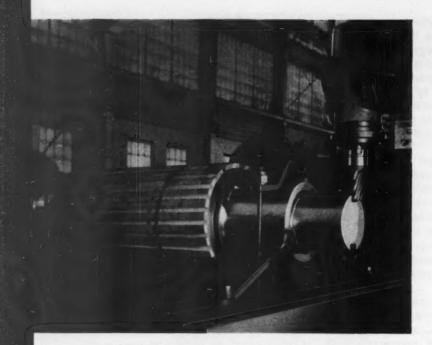


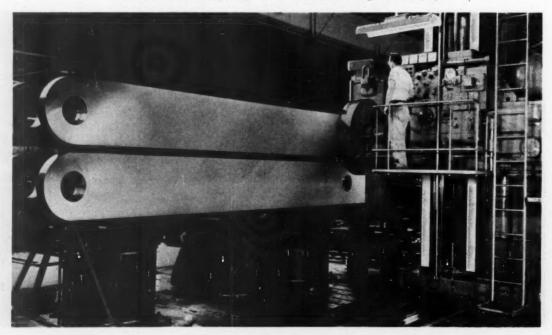
Fig. 6. Keyways in this large steel mill roll are cut by means of an angular milling attachment mounted on the underarm of a horizontal boring machine. V-blocks support the roll.

of its weight and the way it must be mounted for machining. In the illustration, the part is shown placed on two box type parallels, and supported in V-blocks. Using the angular milling attachment, it is a simple matter to mill keyways in the roll.

In some plants, ingenious work-handling meth-

ods have been created. For example, a continuous facing head has been mounted on the underarm of the horizontal boring machine seen in Fig. 7, to face two arms for an aircraft stretch-forming machine. The machine column is traversed along the runway while performing the facing operation.

Fig. 7. A continuous-feed facing head is mounted on the underarm of this machine to face two arms used on an aircraft stretch-forming machine. The machine column travels along the runway.



160-MACHINERY, November, 1952

Condensed Review of Some Recently Developed Materials

Arranged Alphabetically by Trade Names

MATERIAL TRADE NAME		PROPERTIES	APPLICATIONS		
Plastic Sheet	АЗА	This material has punching and machining qualities similar to brass. It has a tensile strength of 11,900 pounds per square inch, is chemically resistant to acids, salts, and mild alkalies, as well as to most organic solvents.	Used in the manufacture of electronic and other parts where its physical properties prove most useful.		
Drill Rod	Ace Drill Rod	A hardened and ground high-speed steel with a toughness equivalent to that of conventional tool steel and a hardness that is approximately 6 points higher on the Rockwell C scale.	Suitable for punches, knock-out pins. dowel-pins, rollers, plug gages, and tool bits.		
Polishing Compounds	Acme Nos. 2-L-177 2-L-178	These two liquid tripoli compounds are oil-water emulsions that have cutting qualities combined with high coloring ability.	Acme 2-L-177 is recommended for maximum cut, while 2-L-178 is for cut-color on brass, alumi- num, and die-castings.		
Aluminum Tubing	Alcoa Utilitube	Made of Alcoa aluminum alloy B50S-O, it exhibits good flaring and forming characteristics. It bends more easily than annealed copper and work-hardens less under repeated bending. It also exhibits high resistance to corrosion.	Uses include: fuel, oil, gasoline, and lubricating oil lines for internal combustion engines; fuel gas lines for stoves and heaters; and air, vacuum, and hydraulic lines for brakes and instruments.		
Die Steel	Alhead	This steel can be water-hardened in the same manner as straight carbon or carbon vanadium steels and will have a case of equivalent depth and hardness. It contains 1 per cent carbon, 1 1/2 per cent tungsten, and 1 1/2 per cent cobalt.	Used for making cold-heading dies		
Welding and Brazing Rod	All-State No. 3	Welding and brazing rod for cast iron that employs a smaller quantity of critical materials than nickel-base welding alloys. It flows readily, makes a denser deposit, and is easily machined. Other properties include a tensile strength of 4800 pounds per square inch, a Brinell hardness of 170 to 200, and a working temperature of 1400 to 1500 degrees F.	For repairing breaks and cracks, filling blow-holes, and building up worn surfaces, as well as for general production work. A flux for cast iron and a neutral oxyacetylene flame are used with this rod.		
Aluminum Caloring and Protecting Process	Alumox 44	The process which uses these salts gives color to and produces a protective coating on aluminum parts. Both the coating and dyeing occur simultaneously. The coatings produced are relatively non-conductive and have a thickness of approximately 0.0001 inch.	Applied by means of an immersion bath. Almost all aluminum alloys can be treated, including wrought and cast alloys. Objects treated include aluminum hardware, jewelry, nameplates, automobile trim, etc.		
Plastic Sealing Liquid	Anaerobic Permafil	This plastic material remains liquid as long as a stream of air passes through it, but solidifies in a few minutes when kept away from air. It hardens fully without evaporation taking place and can penterate extremely small cracks.	Can be used to bond metals, paper, and fabric; as a substitute for a lock-nut by placing a few drops on the threads of a boit before the nut is screwed on; and similar applications.		
Phosphatizing Compound	Anchorite 100	This compound makes the surface of steel, iron, zinc, and cadmium parts re- sistant to corrosion and provides a base for organic coatings.	Applied by immersion or spraying, depending on production needs.		

MATERIAL	TRADE HAME	PROPERTIES	APPLICATIONS
Water Remover Compound	Aqua-Off	Work-pieces immersed in this compound and gently agitated have water displaced from their surfaces; the water falls to the bottom of the container. The slight film left on the surface is removed by the vapors in a degreaser.	This compound removes water from plated or unplated work, eliminating the use of sawdust or drying cabinets.
Stripping Oil	Archer-Daniels- Midland Strip- ping Oil	This material is said to be so stable that decomposition is negligible.	It is used as an oil-stripping medium for hot-dip tin and terne plating.
Metal-to-metal Bond	Armstrong Adhesive A-6	This thermosetting compound requires only contact pressure for joining. It cures at room temperatures and does not shrink, swell, or creep.	Particularly suited for bonding together many hard-to-bond metals, including aluminum.
Stainless Steel Marking Process	Ateenate	This process reproduces any design, character, diagram, or photograph on stainless steel. The marked surfaces are chipproof, corrosion and abrasion-resistant, and will not peel or crack.	Useful in such applications as marking labels and instruction blanks for machinery and equipment, dials for electrical controls, and instrument panels for marine, automotive, and aircraft use.
Gas-forming Powder	Atmosand	This non-toxic, non-inflammable, and free-flowing powder decomposes into protective atmospheres of hydrogen, carbon monoxide, and nitrogen.	For preventing bluing, scaling, and decarburization of steel, brass, and copper parts and for nitriding, bright heat-treating, annealing, or copper brazing in non-generator equipped furnaces.
Plastic Synthetic Finish	Base VC-38	This finish, when applied to iron, copper, gold, cadmium, chromium, nickel, and brass, provides durabl'ity and resistance to marring and tarnish. It can be tinted to give a gold or brass color to steel or aluminum.	Useful for finishing such parts as door knobs, trunk locks, handles, etc. The plastic coating is available in either a satin or flat finish and is applied by dipping or spraying.
Bluing Compound	Bearing Blue	A non-drying compound for use in spot- ting, scrapping, and fitting of various machine component parts.	It is obtainable in 4-ounce cans for average shop use.
Cast Alloy-steel Rolls	Birdsboro 30	Copper-molybdenum cast alloy-steel rolls which do not require water coolant, due to their heat dissipating qualities. They are used to reduce high-speed steel from ingot to billet form. They will not take a permanent bend, thereby allowing rolls to be used continuously.	Permits faster production of billets to meet the demand for high-speed tool steel. These rolls are available in sizes from 10 to 32 inches in diameter and from 30 to 66 inches in length.
Barrel Burnishing Compound	Blue Magic Compound No. 0-221	This emulsion mixes readily with water, has no objectionable odor, is not irritating to the skin, and may be used repeatedly. It can be removed from the cutting medium or work by a water rinse.	Used to produce a hand-buffed appearance on metals wet tumbled in standard barrel finishing equipment.
Barrel Finishing Compound	Blue Magic Compound No. 1 (Double Strength)	A highly concentrated paste designed to be used in small quantities. It is said to yield uniform metallic colors and finish in short time cycles.	For roughing, deburring, cleaning, and finishing of brass, bronze, copper, gold, and silver stampings, castings, an 1 machined and drawn parts.
Barrel Finishing Compound	Blue Magic Compound No. C-5	A non-dusting, non-irritating, soapy con- centrated powder that has a detergency and rinsibility which causes the barrel finished parts to leave the tumbling barrel free from any foreign matter that might impair subsequent painting, plating, or other operations.	Can be used with any tumbling medium to obtain mirror finishes on alloy-steel parts in twenty to forty minutes.

MATERIAL	TRADE NAME	PROPERTIES	APPLICATIONS
Barrel Finishing Compound	Blue Magic No. S-12 Compound	A highly concentrated non-dusting white granular compound that is said to reduce deburring and finishing time substantially.	For deburring and barrel finishing operations.
Cutting Compound	C-5 Cutting Compound	A compound which prevents galling and pitting of metal surfaces, permits high cutting speeds, and maintains uniform cutting temperatures. It has high temperature- and pressure-resisting qualities.	Recommended for boring, turning, tapping, threading, broaching, etc., stainless steel and other alloys.
Corrosion- resistant Coating	Carclad	Having a Vinylite resin base, this coating provides long life and resistance to the corrosive effects of acids, soda ash, sulphur, alkalies, phosphate, common salt, and cement. It exhibits weather durability and abrasion resistance. Some chemica's will soften the finish, but it will reharden to the original state when allowed to dry.	For use on railroad hopper cars and similar equipment to resist the corrosive action of acids and other chemicals. The same equip- ment and technique normally used for synthetic lacquer or enamel are employed in applying this coating.
Alloy Steel	Carilloy T1	A multiple-alloy plate steel that combines high strength with excellent ductility and toughness, even at sub-zero temperatures. It is resistant to atmospheric corrosion and requires no special heat-treatments either before or after welding or gas-cutting operations.	Specially suited for use at low temperatures, it provides high strength, ductility, and tough- ness. It may be fabricated, bent, or formed cold if sufficient power is available to overcome its high yield strength. In the hot-formed condition, it is liquid quenched and tempered.
Corrosion- resistant Tubing	Carpenter B Carpenter C	Alloy B tubing resists the effects of hydrochloric acid in all concentrations at all temperatures, and the effects of sulphuric acid above 80 degrees C. Alloy C tubing will withstand strong oxidizing conditions as encountered in various saline and acid solutions.	Suitable for handling a variety of oxidizing and reducing cor- rosives. Round tubing of these alloys is available, annealed or pickled, in diameters ranging from 5/8 inch to 4 1/2 inches.
Hot-working Steels	Carpenter Cerium-Bearing Alloys	The addition of cerium imparts a greater degree of hot worksbility to corrosionand heat-resistant grades of AISI Nos. 309, 310, 316, 317, and 330 stainless steels, as well as Carpenter No. 20 stainless steel and austenitic valve steels.	Applications include heat-resistant baffles and shields, parts for jet and turbo-jet aircraft, and heat- and corrosion-resistant valves for internal combustion engines.
Rust Inhibiting Oil-base Paint	Certified Rust Inhibitor No. 425	This paint is resistant to fumes, salt air, and heat up to 500 degrees F., and can be applied to either new or rusted metals.	It serves as a rust preventive and finish coat in one applica- tion on damp or dry surfaces.
Copper Alloy	Chase Tellurium Copper	This alloy has a machinability approaching that of free-cutting brass and an electrical conductivity 90 per cent of that of pure copper. It may be hot-worked and also severely cold-worked, although it is somewhat less ductile at room temperatures than pure copper.	It is well adapted for use in welding and cutting tip products, and is supplied in a hard or half-hard temper in the form of rod and bar.
Chromium- plating Anode	Chrome-Flo	An anode with decreased insoluble chromate film formation; open type construction makes higher current densities possible due to better circulation and increased anode surface exposure. Light weight facilitates easier handling.	These anodes are available in 6 per cent antimony-lead and 7 per cent tin-lead alloys for use in chromium-plating metals.
Lubricating Coolant	Cool-O-Lube	A concentrate which when mixed with water produces a non-injurious, smokeless, non-rancid, non-rusting coolant with high film strength, super-oiliness, and low viscosity.	For use in metal-cutting opera- tions. Recommended for use with "Pur-o-luber" equipment but may be applied by conven- tional methods.

MATTRIAL	TRADE HAME	PROPERTIES	APPLICATIONS
Copper- Silver Alloy	Copper- Silver Bronze	An easily machinable, high-strength alloy with high electrical conductivity containing 94 per cent copper and 6 per cent silver. When heat-treated it exhibits tensile strengths ranging from 140,000 to 165,000 pounds per square inch. Its electrical conductivity (referred to standard copper) is 70 per cent.	Available in heat-treated and cold-worked condition. Used for spring parts requiring high electrical conductivity and also for watch and instrument parts which may be blanked from narrow strip.
Rust Preventive	Cor-ln	Forms an adherent film of crystals that vaporizes and acts as a neutralizing agent, destroying the corrosive effect of all moisture or water vapor that comes in contact with it.	Applied by brush, spray, or dip The part is wrapped or covered to provide the greatest protection. Protects dies and hand tools, cutting tools, work in pro- cess, and parts in shipment and storage.
Multi-purpose Grease	Cosmolube	A grease of smooth texture which clings well to all metal surfaces, reducing liqui- dation to a minimum. It exhibits a re- sistance to extremes of temperature and wet conditions.	This grease, which is oxidation inhibited, is a general-purpose grease for use in industria plants.
Lead-clad Copper	Cupralum	A lead-clad copper which exhibits the acid resistance of lead and the electrical conductivity and heat transfer properties of copper.	Used as anodes in the plating industry where great currentiow from the anodes through the electrolyte to the work is desirable.
Organic Cutting Fluid	Cut-Cool	This cutting fluid, used in low concentra- tions, is readily emulsifiable in soft or hard water to form a very thin adherent film on metals, which gives tool lubrica- tion and imparts corrosion-resistance. Its stability insures low "drag-out" losses and it can be removed from the metal by the use of an alkali wash.	For use in general machining cold-drawing operations, and we grinding. Concentrations of liper cent can be used for drilling, milling, and cold-drawing and 2 per cent concentrations for wet-grinding.
Die Lubricant	Dayton- Rogers Die Lubricant	This lubricant provides proper lubrication for the cylinder and piston and other working parts. In addition, it prolongs the life of cup packings on the die cushion cylinders.	Specially compounded for pneu matic die cushions. Available in 10- and 35-pound pails.
Plastic- armored Metal Tubing	Dekoron	Plastic-coated seamless tubing or plastic- coated tubing with welded, lap, or butt seams. It will not crack, chip, peel, or flake, and resists corrosion from salt air, moisture, oils, acids, and alkalies.	Now available in square, trian gular, oval, and streamline shapes as well as the standard line of round shapes. It come in a variety of sizes, colors, and finishes. Used in many industria applications such as automotive parts, industrial instruments, and electrical conduit lines.
High-speed and Die Steels	Desegatized Steels	These high-speed steels and die steels are free of carbide segregation and exhibit good hot-forming properties, good machining qualities, uniform response to heat-treatments, and toughness.	Used for those applications where its physical properties can be employed to best advantage.
Liquid Soldering Flux	Divce No. 229	This liquid flux eliminates almost all the pre-soldering cleaning and burnishing of metal parts. A light squeeze on the container directs a fine stream of flux to the parts to be soldered.	It is applicable for rapid solder ing operations on copper, brass bronze, nickel, cadmium, zinc tin, galvanized iron, steel, and Monel metal.
Ground Flat Stock	DoAll Ground Stock	A fine-ground, electric furnace, oil-harden- ing tool steel that possesses non-deform- ing qualities.	For making gages, punches, dies templates, jigs, fixtures, stripper plates, other tools, and machine parts.

MATERIAL	TRADE NAME	PROPERTIES	APPLICATIONS
Silicone Release Agents	Dow Corning 7 Emulsion Dow Corning Mold Release Emulsion No. 35 Dow Corning 7 Compound	The two emulsions are of the oil-inwater type and can be diluted by the further addition of water. The No. 7 compound is a heat-stable, oxidation-resistant, grease-like silicone that retains its consistency over a temperature range of —40 degrees to over 400 degrees F.	Used in the sand-resin shell process of metal casting. The use of these agents permits the pattern plate to be utilized many times in the making of the molded shells, since there is a very small amount of build-up on this plate.
Drawing Compounds	Durpon Series	Compounds providing optimum lubrica- tion over long periods of time. They con- tain a stabilizing additive which prevents contamination of the drawing ingredient.	These drawing compounds, which are alkaline in nature, are used for wet-drawing non-ferrous wire, rods, and tubes.
Lapping and Polishing Abrasive	Dymo-C	A diamond abrasive prepared especially for lapping and polishing carbide drawing and heading dies.	Available in the following National Bureau of Standards grades: 1, 3, 6, 8, 14, 30, 45, 230 mesh, 170 mesh, and 100 mesh.
Metal Cleaner	Dynakleen	This compound removes all types of foreign matter including grease, oils, and discolorations. It dries quickly and can be used repeatedly with only occasional filtration.	Designed specifically for the quick removal of buffing and drawing compounds from knurled or fluted surfaces of all metals. Also useful for preparing metal surfaces for plating, painting, Parkerizing, bonderizing, and galvanizing.
Plastic Rod	Dynakon-F	A plastic material of high tensile strength having good electrical and corrosion- resistant properties. It is resistant to acids and mild alkalies, as well as to salts and most organic solvents.	Used in making stand-off in- sulators, tension rods, chemical equipment supports, structural members subjected to corrosive atmospheres, and other parts used in similar applications.
Plastic Sheet	Dynakon G1A	A glass-fiber reinforced plastic sheet which resists the action of acids, salts, and mild alkalies, as well as organic solvents. Its tensile strength is 19,000 pounds per square inch.	Designed for applications in the electrical and chemical field where stress is encountered. It is available in sheets 18 by 28 inches in size in a variety of thicknesses.
'Weld- Through'' Sealer	EC-1168	This aluminum-colored sealer is applied to faying surfaces by means of a calking gun, pressure extruding equipment, or scraper before spot welding, thus eliminating the need for a sealing operation after welding. It is a heavy paste-like material that is said to resist the heat and pressure of welding without splattering or burning.	Automobile manufacturers use this material to seal the spot- welded joint between the roof and side panels of automobiles. Another use is the sealing of seams of ventilating and air- conditioning ducts.
Copper-clad Steel	ElectroShield	A base sheet of low-carbon magnetic steel that has chemically pure rolled copper metallurgically bonded on either one side or both sides. This material exhibits resistance to corrosion and low thermal expansion properties. It is ductile, easy to work, and can be resistance-welded, soldered, and brazed. Such operations as drawing, spinning, stamping, and punching can be performed on it.	Originally developed to provide improved shielding and housing of electronic equipment, its application has been extended to many other fields where products are made of copper sheet, such as the automotive, refrigeration, hardware, and chemical industries.
Metal- working Coolant	Emulsifier STH	A water-soluble, metal-working coolant which possesses good lubricating properties and can be used with both ferrous and non-ferrous metals and alloys.	Recommended for all types of metal-working machines that employ coolant recirculating systems properly sealed for handling water emulsions in cutting, grinding, drawing, and stamping operations.

MATERIAL	TRADE NAME	PROPERTIES	APPLICATIONS
Metal Stripper	Enthone Solder Stripper	An alkaline chemical for dissolving tin, lead, and tin-lead alloys. There is no attack upon such base metals as copper, brass, bronze, steel, and stainless steels.	Used to remove tin, lead, and tin-lead electrodeposits, heavy solder, and hot-dipped coatings.
Chromate Coating Process	Enthox	A process which is operated at room temperature and uses from 1 to 2 ounces of salt per gallon of water. Provides a hardened chromate coating which can be dyed various colors, including jet black and red.	For producing chromate coatings on zinc and cadmium plate and zinc-base alloys. These coatings serve as bases for organic finishes, including paints, enamels, and lacquers.
Lubricating Film Process	Extrudite	A process which consists of two warm immersion baths. The first forms a fine porous phosphate coating. The second impregnates this coating with a heat-resistant lubricant.	Used for the formation of a tough lubricating film on steels used for cold-forming.
Lead-clad Steel	Ferrolum	A lead-clad steel which has the sulphuric- acid resisting qualities of lead combined with the strength of steel.	Used in making containers, tanks, piping, etc., for handling such materials as sulphuric acid and nuclear products.
Molding Compound	Flexicast	A synthetic resinous material developed for making molds that are flexible, yet accurate and permanent. It is set by placing it in a furnace heated to 175 degrees F., and allowing it to cure one-half hour for each half inch of thickness.	This cold-pour semi-liquid, requiring no mixing, is used for taking impressions of internal contours for inspection purposes. Trueness of impressions makes it possible to check such faults as under-cutting of internal threads.
Cleaning and Degreasing Emulsion	FO-106	A solvent emulsion cleaner concentrate which is diluted with kerosene or Stoddard solvent in proportions from four to nine parts of solvent to one part of compound. This cleaner is harmless to the skin.	It is applied to metal or painted surfaces by brushing or spray- ing to emulsify dirt and grease, which are later carried off in the rinse.
Plastic Cement	Form-A-Jig	This plastic cement compound holds parts together during welding operations. It will not soil, mar, or corrode the surface of metals to which it is applied.	Used as a substitute for a metal jig in cases where small lots are to be welded. May also be used in tool salvage and similar maintenance for holding broken sections together.
Ductile Brasses	Formbrite	These copper alloys are stronger, harder, and springier than ordinary drawing brass, and yet retain sufficient ductility for deep-drawing, forming, and cold upsetting. Fine-grained structure provides a smooth surface that buffs to a lustrous finish. It is easily machined.	Comes in the form of sheets, strips, wires, rods, and tubes to ASTM specifications for either quarter- or half-hard stock. Can be used in manufacture of such wire products as rivets and screws.
Refractory Material	Fused Stabilized Zirconia	Molded shapes of this material will with- stand temperatures up to 4600 degrees F. Thermal properties make possible its use in both the chemical and electrical indus- tries.	Used as furnace lining bricks for gas synthesis in the chemical industry, setter plates in capacitors for the electronic equipment field, heating elements for electrical furnaces, conveyors for molten steel, and thermal insulation for high-frequency induction or resistor-wound furnaces.
Binding Resin	G-E 12353	This resin facilitates the molding of strong sand cores, has high water dilution and good handling characteristics by pro- viding good collapsibility and easy shake- out.	When mixed with water and sand it produces strong sand cores. As a spray it increases the hardness of oil- or resinbonded cores to protect cores from breaking.

MATERIAL	TRADE NAME	PROPERTIES	APPLICATIONS		
Silicone- rubber Compound	G-E 81223	After a five-minute warm-up, this compound exhibits excellent molding and extrusion properties. Its hot-tear strength enables parts with under-cuts to be removed from molds.	Being neutral in color, it can be colored for product identification purposes. Applications of this compound include the manufacture of diaphragms, beiting, hose, and mountings.		
Chemical Bond	G-E 81267 Primer	A material for bonding silicone rubber to metals or ceramics. The bond strength is greater than that of rubber. On steel it exhibits a shear strength of about 700 pounds per square inch.	Can be applied by dipping and draining, spraying, or brushing. Applications include shock and engine mounts that resist both high and low temperatures and rubber-glass laminated struc- tures.		
Polyvinyl Resin	Geon 404	A polyvinyl resin that can be processed without a plasticizer, which exhibits the electrical, physical, and chemical properties of pure, unmodified polyvinyl chloride. It can be processed by extruding, calendering, or molding into "rigida" on conventional plastics equipment.	Produced in the form of sheets, rods, and tubing in a wide variety of colors. It can be welded by the hot gas technique, fabricated, machined, and deep-drawn into various forms, such as fume hoods and ducts, pitchers, trays, funnels, buckets, barrels, etc. For use wherever an inert material is required.		
Abrasion- resistant Metal	Grade 608 Chrome Carbide	Exhibits high resistance to both corrosion and abrasion, has a coefficient of thermal expansion approximately the same as steel, is non-magnetic, and has resistance to high-temperature oxidation.	This carbide is used in the gage and instrument manufacturing field where wear resistance, tem perature effects of expansion, and corrosion resistance are im- portant considerations.		
Tool Steel	Graph-Mo Hollow-Bar	A turned and bored bar section using Graph-Mo tool steel for the basic material. Its machinability is comparable to that of gray cast iron, and it exhibits good wear resistance.	Available in stock sizes from about 3 to 16 inches outside diameter with the variety of wall thicknesses. It is used in manu- facturing ring gages, dies, and other annular tool steel parts.		
Metal Fasteners	GRC Rivets	These small zinc-alloy tubular and semi- tubular rivets are rustproof and corro- sion-resistant. Rivets exhibit a tensile strength of 45,000 pounds per square inch.	Rivets are suitable for machine and hand applications, and are available in standard sizes, including diameters from 1/16 to 9/64 inch and lengths up to 3/8 inch, with oval or flat countersunk heads.		
Abrasive Fabric	Griteloth	A tough, open-mesh fabric with embedded abrasive which permits removed stock to float through the openings. The cloth is cleaned by rinsing in water.	Used wet, dry, flat, or folded on sanding machines, and by hand, for removing metal, wood, etc., in roughing or smoothing.		
Transparent Cutting Oils	Gulf Lasupar Cutting Oils	These oils are light in color and transparent, have anti-rust properties, and retain all performance characteristics of former grades.	When used with cutting tools, they exhibit anti-weld properties and load carrying ability.		
Rust-preventive Compound	Gulf No-Rust No. 6	A thin-film type rust preventive which provides 390 square feet per gallon surface coverage. Will not crack, chip, scale, disintegrate, or flow at temperatures up to 190 degrees F.	May be applied by brush, spray, or dipping and is quick drying. It can be readily removed with kerosene, Stoddard solvent, or similar petroleum solvents.		
Magnesium Finishing Compound	НАЕ	This compound forms a strongly adherent bond with magnesium to provide a cor- rosion-resistant and hard coating. Other properties include high melting point, good dielectric strength, and a brown color of varying shades.	Applied electrolytically to any commercial wrought or cast magnesium alloy, it forms a coating which is an excellent paint base. Safe to apply to magnesium castings without danger of entrapped electrolyte corroding the metal.		

MOTERIAL	TRADE NAME	PROPERTIES	APPLICATIONS
Casehardening Compound	Hard'N'Tuff	This compound increases the hardness and wear resistance of the metal to which it is applied. It is possible to produce a nitriding and carburizing effect on properly heated steel surfaces.	For use on high-speed stee drills, and cutting edges or wear ing surfaces of dies, molds, ham mers, cams, etc. It is also appli- cable to cast iron.
Aluminum Paint	Heat-Rem	A heat-resistant silicone-aluminum paint which fuses with the metal surface, forming a bright elastic finish that is resistant to moisture, corrosion, mild acids, alkalies, and industrial fumes.	Applicable to exterior and in terior metal surfaces at tempera tures of 1000 to 1500 degrees F It sets in about four hours. Suit able for use on heat lines, ra diators, condensers, compressors and ovens.
Heavy Non-cutting Metal	Hevimet	A non-cutting metal which resists the penetrations of radioactive rays. It has a density which is 50 per cent greater than lead.	This metal, suitable for statuand dynamic balancing, is used for balance weights on crank shafts, gyroscopes, propellers and centrifugal clutches.
Wetting Agent	Hydrodyne	Addition of this multi-phase wetting agent to regular coolants results in improved heat dissipation and longer tool life, and permits increased machining speeds. It exhibits low surface tension, which permits penetration of the finest crevices.	One part of this compound added to 1000 parts of coolant assures intimate contact with the working surface and accelerates dissipation of heat in ordinary machining operations.
Nickel Alloy	Incoloy	Developed to conserve nickel supplies, it contains about 35 per cent nickel and 20 per cent chromium, with the balance iron. The new alloy will fill many of the purposes served by the older alloys, some of which have a nickel content of 70 per cent or more.	Intended for use under conditions of high temperature and corrosion, it is produced in most standard, rolling mill forms, in cluding sheet, strip, rod, wire and tubing.
Reinforced Phenolic Laminate	Insurok Grade T-815	This laminate is reinforced by unwoven cotton fibers laid at random in a mat arrangement, which results in uniformity of strength (tensile, impact, and flexural) in all directions throughout the planes of the material. It is easily machined to a good finish and has good electrical and moisture-resistant properties.	This plastic can be punched shaped, turned, milled, drilled or threaded in the production of non-metallic gears, cams, pinions and textile bobbin heads.
Cleaning and Phosphatizing Compound	lon-Kote	A white, granular, dustless powder which removes most cutting and forming com- pounds, rust preventives, smut, and other dirts. It deposits a hard, dust-free phos- phate coating on metal, which prevents rusting and increases paint adherence.	Applied by spray washers, it prepares steel and other metals for painting.
Isolating Paste	Isopac	This product is used to prevent harden- ing of certain sections of work-pieces which are being casehardened. Its stabil- ity prevents cracking and shrinking while in use.	This paste replaces copper-plat- ing, machining, or other methods of protecting certain areas against hardening.
Chemical Solvent		When mixed in a solution of from 1/2 of 1 per cent to 1 per cent with water, it offers a thin, inexpensive solution which can be used in almost all methods utilized for cleaning metal parts. It is odorless, non-corrosive, non-toxic, non-inflammable, and harmless to the skin.	Used in the manufacture of ball and roller bearings and other parts prior to heat-treatment for cleaning parts before chromium- plating or lacquering, and for cleaning machined aluminum aircraft parts.
Metal Cleaning and Phosphatiz- ing Agent	Klem-Kote	This cleaning agent imparts an iridescent, crystalline, and adherent phosphate coating to the surface of metals. The phosphate coating produced retards rust and provides good bond for industrial finishes.	Successful applications of this compound have been made in automobile, refrigerator, and other industries.

MATERIAL	TRADE WASH	PROPERTIES	APPLICATIONS	
General-Kling-Oil purpose Oil		An SAE 30 viscosity oil having great metal adhesiveness. Not affected by the rubbing action of moving parts. No "gumming" or "build-up" is experienced after continued use.	Applied by methods ordinarily employed for oils in this class Its use results in less dripping and spattering, and promotes safer, cleaner shop conditions.	
Primer	Lankote PR-1	This coating adheres to metals with a bond that is half mechanical and half chemical due to the etching action of the acid diluting agent. It is supplied as two components which are mixed prior to use.	Applied by spraying, brushing or roller-coating. It is air-dried or baked in a few minutes. This coating may be used on those surfaces which normally require phosphatizing, Parkerizing, or bonderizing.	
Lead- bearing Steel	Leaded TS 4140 Modified	This steel will machine one-third faster than the comparable non-leaded grade applications.	Is available cold-drawn in various size ranges in rounds and hexagons.	
Corrosion- and Heat-resistant Coating	Leafcote	A tough adhesive coating that will not peel or crack in drawing or forming operations.	It is applied to both sides of cold- or hot-rolled sheet steel for corrosion resistance.	
Lubricating and Sealing Compound	Lead-Plate	A metallic compound which is a lubricant and a sealer that can be used over a wide range of temperatures.	For use in threaded connections for steam, gas, water, air, oil, and various chemical lines.	
Molybdenum Lubricants	Liqui-Moly Liqui-Moly NV Moly-Wax-Stix	These three molybdenum-base lubricants, available in liquid, grease, or solid form, attach themselves to metal surfaces to form a lubricating film which is not squeezed out by pressure and which can withstand extremes of temperature without affecting its lubricating qualities. In the grease form, it has long life and chemical inertness, is free from carbon and sludge, and will not dry out at elevated temperatures.	Used to prevent metals from seizing or freezing together under extreme pressure, as in pipe and thread joints. Also used for filling lubricant grooves in bushings or thrust washers, for rubbing on sliding ways to provide lubrication without oiliness, and for casting solid lubricant shapes.	
Cooling and Lubricating Compound	Lubri-Cut	This compound is fire-resistant and free from abrasives and acids. It clings to the tool to produce an effective cooling and lubricating action.	It is used in high-speed drilling, blind-hole tapping, countersink- ing, profile routing, swaging, etc., on metals, plastics, and glass.	
Metal Cleaner	Magnus 751	This non-inflammable metal cleaner pene- trates, loosens, and removes all foreign deposits, including paints and other types of coatings.	Uses include the removal of car- bonized oil and gums from rear- end transmissions, brake parts, automotive engine parts, and the cleaning of other automotive components.	
Cutting Fluids	Magnus Cutting Compounds No. 6 No. 7 DO-1A DO-4A	For difficult machining operations compounds Nos. 6 and 7 are used. Where cooling is an important factor, DO-4A and DO-1A are recommended. These soluble oils also give rust protection and minimize the occurrence of rancidity and dermatitis. They do not "gum up" in service.	For machining operations on stainless steel, high-carbon steels, and other metals that are difficult to machine.	
Scale Removing Compound	Magnus D-Scale-RW	An inhibited acid type powder with an added wetting agent. It is safe to handle and does not throw off fumes.	Removes scale or rust from iron or steel parts in tumbling bar- rels, and can be employed either when parts are self-tumbled or when abrasive mediums are used.	
Die Stock	Masonite Die Stock	This product has greater uniformity of strength than previously, and contains less than 3 per cent voids. It weighs less than one-half as much as aluminum and one-sixth as much as steel.	It is used in aircraft and other industries for experimental tool- ing, mock-ups, and models. Avail- able in large panels in thick- nesses of 1/4 inch to 2 inches.	

(MATERIA)	TRADE NAME	1	PROPERTIES	APPEICATIONS
Metal- cutting Agent	Metalloid X-30	ganic c staining agent i ploys a cutting	gent employs as a catalyst an or- ompound which is said to be non- grand transparent. The cutting s odorless and non-toxic. It em- ny regular paraffin or naphthenic oil as its vehicle and may be used as a high as 4 to 1.	Applications include the manufacture of silver bearings and other alloys where processed cutting agents have not been previously permissible because of staining characteristics. It is suited for grinding operations as it is transparent, permitting close scrutiny of work.
Stripping Compound	Metal Stripper N-165	chromicopper	dly strips nickel, tin, lead, and um from copper, brass, and other alloys without attacking the base No electric current is used.	For removal of nickel and chromium from bulk plated work and plating racks. It is not suitable for removal of nickel from steel or zinc-base alloys.
Wear-resistant Coating	м.н.с.	resistar steel. I process	pating for aluminum has a wear ace twice that of casehardened t is applied by an electrochemical . For average jobs, it is spread at 0.002 inch thick.	For use in many items that for merly required heavier metal especially in aircraft applications. Coatings also have been applied to gears and pinions, surveying instrument parts, and hand tools.
Brazing Material	Mo-braze	of app	ler which melts at a temperature roximately 3450 degrees F. and a continuous, strong braze upon ation.	Used in the high temperature brazing of molybdenum and tungsten electronic components
Brazing Alloy	Nicrobraz	brazing possess grees F	and corrosion-resistant alloy for stainless steel. A brazed joint es the same strength at 2000 de- as the parent metal, and has bet- osion and oxidation resistance.	For brazing Series 300 and 400 stainless steel, Inconel, Monel, alloy steels, tool steels, carbon steels, etc. Assemblies to be brazed are prepared the same as for copper-brazing.
Emulsion Type Cleaners	Northwest Addition Agent No. 230 Northwest Emulsion Cleaner No. 3	added to	ither of these two compounds is to petroleum solvents, it forms a emulsion cleaner which degreases aced in it. Agitation is essential.	Used in the cleaning of parts. After cleaning, parts must be thoroughly spray-rinsed.
Rust Control Compound	Nox-Rust 310-AC	steel st when e humidit package	ompound will protect machined urfaces for a period of 150 hours xposed to 100 per cent relative y at 100 degrees F. Parts not d may be stored safely for from three months.	Applied by brushing or spraying, but the cold dip method is recommended for maximum effectiveness, especially where fingerprints are to be removed.
Buffing and Coloring Composition	No. 4-S-10	compos	r dispersible buffing and coloring ition which is easily removed by solutions, using a mild alkaline with or without electric current.	For buffing and polishing metal products having deep filigrees in which the buffing compound becomes packed in hard masses. For all non-ferrous metals except nickel.
Aluminum Solder Rod	No. 37 Aluminum Solder Rod	sures of melts a degrees	y applied, it will withstand pres- f 1000 pounds per square inch. It t 400 degrees F. and flows at 450 F. and is lead-free. It gives good g color and is corrosion-resistant.	Applied by soldering iron or indirect heating in such applications as electrical signs, television and radio parts, etc. Used on all types of aluminum except 24S-T, and can be employed for seldering aluminum to dissimilar metals.
Aluminum Solder Flux	No. 39 Brazaloy Flux	of wate	hat is reactivated by the addition r and can be used with any type inum solder rods.	It can be employed with an open flame, and in some cases, with a soldering iron to solder alu- minum to other metals, such as copper, steel, and bronze.

MATERIAL.	TRADE NAME	PROPERTIES	APPLICATIONS	
Wax Lubricant	No. 140 Stik-Wax	A blend of solid waxes put up in stick form provides a durable, clean lubricant for metal-working operations.	Applied manually or automatically, it is used for metal- sanding, metal-sawing, drilling, tapping, etc.	
Corrosion- resistant Silver Solder	No. 155 Premium	This solder is characterized by a narrow plastic range. It has a working temperature of 1155 degrees F. and develops a tensile strength of 50,000 pounds per square inch.	In the form of brazing rod, it is applied by torch or furnace meth- ods in copper, copper-alloy, and ferrous-alloy brazing.	
Liquid Phenolic Casting Resin	8000 Tool Plastic	This plastic eliminates shrinkage and facilitates economical production of dimensionally stable tools and models without elaborate shop equipment or highly skilled personnel.	For producing checking fixtures, large hydraulic and stretch press dies, jig bases, master models, trimming and routing fixtures, spinning checks, etc. This plastic is always used with an accelerator paste.	
Metal Cleaner	Oakite Compound No. 31	A highly concentrated liquid detergent which cleans, derusts, and gives a phos- phate coating in a single operation.	For prepaint treatment of met- als, including aluminum sheet and aluminum castings.	
Jet Black Finish	Parco Black	This product is used in water solutions to produce a jet black finish for iron and steel that has good corrosion resistance.	For iron and steel parts includ- ing those that are machined or threaded. The surface is oiled or waxed before service to pro- duce a deep black durable finish.	
Molding Compound	Parker Compound 90	A rubber synthetic molding compound which has high heat resistance (up to 225 degrees F.), low compression set, and high hardness.	Used for making O-ring seals for tanks and other military vehicles.	
Anti- rust Paints	PCA-100 PCA-101	Two penetrating and sealing anti-rust paints that can be applied directly over rusted surfaces. Paints penetrate through the rust layers into the base metal and seal the surface against further rusting.	May be applied by brushing or spraying, for interior or ex- terior use. PCA-100 is black, and is recommended as a finish coat. PCA-101 is clear and can be painted over.	
Scale Removing Compound	Pennsalt SR-4	This salt is dissolved in weak muriatic acid and water to form a bath for removing furnace scale during quenching in the production of heat-treated steel forgings.	For removing furnace scale from plain carbon steel and some SAE alloy steels, making them clean for subsequent machining operations.	
Rust Preventive Additive	Petrobase 210	A synthetic rust preventive additive for petroleum oils, petrolatums, and waxes. This compound causes oils and waxes to displace water from metal surfaces and prevents redeposition of aqueous vapors or liquids on the metal surface.	Used mainly in the following classes of oils: Preservative oils and compounds; industrial preservative or "slushing" oils; oils used to lubricate small motors, hinges, tools, and other household appliances; and water displacement fluids.	
Laminating Material	Phenopreg LP-502	A tacky, low-pressure laminating material composed of glass fabric impregnated with General E'ectric Permafil resin. Although tacky, it is easy to handle and does not deposit resin on the user's hands.	For making molding lay-ups of aircraft tooling jig fixtures without the use of staples or other fastening devices. These lay-ups may be made of wood or plaster forms.	
Bonding Solution	Phospray	A cold-spray bonding solution which does not require such preparatory steps as cleaning, rinsing, drying, etc. It dries immediately upon spray application and is ready for the final finish.	Used for all metal products except aluminum. It can be used in the proportion of three parts of thinner to one part of solution reducing its effectiveness.	

MATERIAL	YEAD! PAME	PROPERTIES	APPLICATIONS
Metal-to-metal Rubber Cement	Plastilock	A rubber cement that bonds metal to metal with great holding power.	For bonding brake lining to brake-shoes in motor vehicle and for cementing metal sec- tions of gasoline tanks.
Corrosion- preventive Coating	Powerfilm	When dry, this coating is non-oily, non- toxic, and will not crack or chip. It thins down when stirred or brushed, but thick- ens when left standing.	For weather-exposed machiner and tools. May be applied by brushing, spraying, or wiping Removable with naphtha.
Brass and Soldering Pre-forms	PresSint Pre-Forms	These pre-forms are made from powdered alloys containing flux and provide the means whereby metal parts may be joined together by the application of heat from a flame, atmosphere furnace, or induction heating furnace.	For brazing and silver-soldering operations where uniform results are required.
Hot-working Steel	Prestem	Readily machinable at comparatively high hardness. Has good impact resistance and a minimum amount of heat checking. Available in three hardness ranges—41-45 Rockwell C; 38-42 Rockwell C; and 36-40 Rockwell C.	For use as solid or insert dies in drop-forging plants that make pressed and upset forgings for the automotive, aviation, and farm implement industries.
Corrosion- resistant Coating for Aluminum Parts	Protecto-Cote	Immersion of aluminum parts in a solution composed of six ounces of this material to one gallon of water at a temperature of 185 degrees F. imparts a corrosion-resistant coating. The coating is obtained after approximately five minutes of immersion.	Used to protect aluminum parts from corrosion and provide a base for painting. Applicable to machine parts as well as decorative products, since no dimensional changes take place.
Hydraulic Fluid	Pydraul F-9	A fire-resistant, non-corrosive, non-inflam- mable, chemically stable hydraulic fluid that exhibits good lubricity and is easily pumped.	This fluid can be used in such equipment as die-casting machines, hydraulic presses, hydroelectric turbines, and glass drawing machines.
Metal Degreasing Fluid	Q200	Grease, oil, wax, finger marks, and mois- ture are readily removed from metals and plastics by the use of this fluid.	For cleaning jigs and fixtures and removing foreign particles from parts to be inspected. Can be applied by dipping, brushing, or wiping.
Resin Accelerator	Quick-Set	Casting resin can be hardened quickly without heat by the addition of this liquid accelerator.	Used in the production of master models, duplicating and foundry patterns, and jigs and fixtures.
Titanium and Titanium Alloys	RC-55, RC-70 RC-130-A RC-130-B	These titanium alloys combine the lightness of aluminum alloys with the strength and suitability for high-temperature service of stainless steel.	Available in bars, sheets, plates, forgings, ingots, and billets of both commercially pure and alloyed titanium. May be used for high-temperature applications and in cases where lightness is required.
Cleaning and Phosphatizing Compounds	Rustclean 12 Rustclean 15	These compounds remove rust, tarnish, and light oil, and chemically prepare metals for paint. They contain a mild acid which offers very little hazard to personnel. The compounds do not produce fumes or emit toxic vapors.	For cleaning the surfaces of steel, iron, aluminum, zinc, and cadmium, and for forming a phosphate coating which will act as a base for organic finishes.
Anti-rust Paint	Rust-Cure	Rusted surfaces can be sealed and further rusting action retarded by the use of this paint. It can be applied on rusted surfaces without wire-brushing, scaping, or sand-blasting.	Applied by brushing, dipping, or spraying methods. It is available in black, aluminum, and clear compositions for painting machinery and buildings.

MATERIAL	TRADE NAME	PROPERT(E)	APPLICAT As
Phos- phatizing Compound	Rustshield 2	This chemical treatment produces a non- metallic coating which, besides being rust- proof, is absorbent, thus serving to retain lubricating oils. Close tolerances are not affected by the treatment.	For rustproofing rubbing and sliding surfaces of iron and steel parts such as thrust washers, pump pistons, gears and valve roller pins, etc.
Organic Metal Preservative	Saf-philm	A solvent type, organic metal preserva- tive film with the ability to resist acids and alkalies. It is fast drying, and forms a colored transparent firm within fifteen minutes after application.	Used for the protection of highly finished surfaces. Applied by means of dipping, brushing, or spraying, and can easily be re- moved with kerosene or solvent.
Flat Leather Belting	Schieren Duxbak Rayon-Core	A flat leather belting incorporating a rayon tire cord insert that assures stretch resistance. It consists of a layer of rayon tire cords cemented between two layers of Duxbak leather belting.	For use where stretch presents a particular problem.
Metal Bonder	Seal-All	A compound that adheres to any metal, toughens with age, and never becomes brittle. It is said to be unaffectd by gasoline, oil, naphtha, alcohol, or water.	This product bonds metal, wood, glass, etc., and has been used successfully to impregnate castings for the prevention of leaks.
Aluminum Paint	Sheffield Super-Hot	It will add a protective and decorative finish to metal surfaces withstanding tem- peratures of 1600 degrees F. The greater the heat, the more permanent the bond. It maintains its brilliance, will not crack, chip, or peel, and is impervious to most ordinary solvents.	Applied by brushing, spraying, or dipping, it dries within thirty minutes, after which time heat can be applied. It is used to paint any metal surface that is subject to heats of from 500 to 1600 degrees F.
Laminated Strip Product	Silver-Clad Steel	A core of mild steel with a solid sheet of silver clad on either one or both sides. Has a high luster, requiring practically no polishing. Properties include high thermal and electrical conductivity and a high resistance to the action of alkalies and organic acids.	Produced as a substitute for such restricted metals as brass, nickel-silver, and nickel. Available in widths up to 4 inches and thicknesses down to 0.005 inch, in any required temper. It is manufactured in various silver-to-steel thickness ratios.
Die Steel	Simonds Air-Hardening Die Steel	An air-hardening type of flat ground die steel which has good wear resistance and a wide hardening range which simplifies heat-treatment. Its spheroidized micro- structure provides good machinability.	Available in forty-three standard stock sizes, this steel is used in making punches and dies.
Nickel-plating Brightener Process	Smoothex Brightener Process	This process, which uses organic additive agents in a standard Watts formula, gives brightness from the start of the plating cycle and removes polishing wheel marks or other flaws from the surface.	For use with buffed brass, steel copper, unpolished cold-rolled steel, and die-castings after conventional copper-cyanide plating.
Self-bonding Metallizing Material		A self-bonding metallizing material that provides long wearing properties for bearing surfaces. It is applied in three operations—cleaning or under-cutting of a part; application of the wire by spraying; and finish-grinding of the sprayed surface.	Used as a finish coating for bearing surfaces and as a foundation for bonding on a coating of a different metal. Can be applied to nickel, nickel alloys. aluminum, magnesium, and various ferrous alloys.
Solders	ST-20N ST-25 ST-30	tin-lead alloys. The addition of silver permits a marked reduction in the tin content of the original alloy.	ST-20N replaces the 30-70 solders used for sealing milk cans, and ST-25 replaces the 35-65 solders used in soldering the end seams of cans. ST-30 4s used in place of the 50-50 or the 40-60 solders. The same fluxes and means of application are used as with previous tin-lead solders.

MATERIAL	A TRADE NAME	PROPERTIES	APPLICATIONS
Silicone Rubber Compound	Stalwart No. 161	This compound has a dielectric strength of 170 volts per mil, exhibits resistance to extreme temperatures, weather conditions, and oils. It has a tensile strength of 470 to 520 pounds per square inch, an elongation of 110 to 160 per cent, and a specific gravity of 2.1.	Available in the form of gaskets, sleeves, washers, channels, seals, tubing, and other molded, extruded, punched, and lathe or die-cut rubber parts. It is used in industrial ovens, steam generators, and die-casting machines, as well as in systems handling hot or cold fluids, gases, and vapors.
Neoprene Rubber Compound	Stalwart No. 808	This grease-resistant material has a tensile strength of 2315 pounds per square inch, a durometer hardness of 60, an elongation of 400 per cent, and a permanent set of 3 per cent.	Used for grease retainers on air- craft universal joints. The mate- rial can withstand concentra- tions of 0.003 per cent of ozone for a six-hour period over a tem- perature range of —87 degrees to 240 degrees F.
Aluminum Etching Compound	Star Etch	Production of a uniform control etch is possible by either dipping or mechanical spraying.	It helps to solve the problems of foaming, sludging, and hard scale formation which are often encountered in aluminum etch- ing operations.
Air- hardening Flat Stock	Starrett No. 497 Air-Hardening Flat Stock	A precision-ground flat stock made to a special analysis for hardening in air. It maintains its dimensions during heat- treatment and is fully spheroidized for easy machining.	Recommended for punches and dies used in long-production runs or for stamping silicon, stainless steel, Monel, and other abrasive materials.
Steel Tubing	Steel Tubing, Highly Finished	This tubing is finished by cold-sizing, and is free from scratches, pits, and other irregularities. The surfaces are smooth enough to be used with leather or other soft packing without requiring any prior machining.	For making hydraulic cylinders and shock absorbers. When used with metal piston-rings, the tubing does not require boring, but may be lightly honed.
Rust Preventive	Stop-Rust No. 0 Special	A coating of this preventive absorbs en- trapped moisture on the surface of metal, floats it out to the coating surface, and evaporates it.	Applied at room temperature by brushing, dipping, spraying, or wiping on, it is readily removed by commercial solvents such as Stoddard solvent or kerosene.
Lead- bearing Steel	Super La-Led	An easily machinable open-hearth steel containing about 0.25 per cent lead and nearly 0.50 per cent sulphur.	Used where good machinability is required and in some instances may be employed instead of brass where corrosion is not a factor.
Metal Cleaner	Super-Mul	A high-strength active solvent emulsion cleaner which rinses freely, resists hard water, and does not sludge out with heavy soil loads.	Recommended uses include metal cleaning in one-stage washers and cleaning prior to bonderizing during processing and before painting.
Die Steel	Super Samson	This steel is capable of being cold-hobbed and exhibits a high core strength and resistance to heat and abrasion. Its rate of work-hardening is somewhat lower than that of some of the other hobbing grade steels.	For die cavities used in die-casting zinc, aluminum, and magnesium, as well as molds for plastics requiring temperatures up to and including 800 degrees F.
Protective Coating	Tarlac	Exhibits the protective and adhesive qualities of coal-tar pitch and is impervious to oils, greases, and other petroleum derivatives, alkalies, acids, etc. Will not crack or run within a temperature range of —56 degrees to 200 degrees F.	Used as a protective coating for concrete structures, floors, masonry, and metals exposed to corrosive elements. Its tough, enduring, flat black film is completely insoluble in water, oil, or gasoline.

Review of Some Recently Developed Materials—Continued

MATERIAL	TRADE NAME	PROPERTIES	APPLICATIONS				
Drawing Lubricants	Ten Series	These lubricants possess adhesive and heat-resistant qualities, which makes it possible to maintain a tough, even, unbroken film around the metal under extreme pressure and heat conditions. They contain no fatty acids or sulphur, are safe for operator's hands, and will not separate out or become rancid.	Used in drawing, forming, staming, cutting, and piercing opertions on stainless steel and other hard metals.				
Welding Electrodes	Tensilend 100 (Grade 230) Tensilend 120 (Grade 260)	Standard welding quality mild steel cores covered with an electrode coating containing powdered nickel, ferro-molybdenum, and ferro-vanadium which produce weld metals of tensile strengths over 100,000 pounds per square inch.	Used in welding high-strength steels and armor plate, they replace electrodes containing critical metals.				
Stick-type Wax Lubricant	Tool-Saver	A mixture of wax ingredients designed to reduce the friction and the heat accompanying machining operations.	For use on such tools as saw bands, knife bands, circular saws hacksaws, twist drills, etc.				
Electrical Steel	Tran-Cor T-O-S	A thin electrical steel employed at inductions considerably higher than those for which nickel-iron alloys are suitable. It has a density of 7.65 grams per cubic centimeter, a volume resistivity of 282 ohms per mil foot, and a lamination factor of 95 per cent solid. Can be slit, sheared, and bent without cracking.	Intended for use in wound type transformer and reactors that operate at 400 cycles. Permit reduction in size and weight of airborne electrical equipment.				
Transparent Cutting Oils	Transultex Grades A, A-1, and B	Because of their transparency, these cut- ting oils provide a clear view of the prog- ress of the work.	Used in such machining opera- tions as hobbing and threading.				
Cutting Compound	Triple-Chip Soluble Oil	This oil withstands high heat for long periods, adheres to the tool, mixes readily with water, and resists contamination. It is said to keep chips from "welding" to the tool and flying from the work-piece.	Used for sawing, slitting, and slotting operations, it is odorless smokeless, non-corrosive, and maintains its properties while in storage.				
Transparent Cutting Fluid	Tuff-Kut	An oilless, water-soluble, transparent, smokeless, and odorless cutting fluid with high film strength, low viscosity, and abil- ity to dissipate heat.	For drilling, milling, tapping threading, sawing, etc. Provide protection against rusting of machine parts.				
Tumbling Compound	Tumb-L-Magic	This compound suspends grease and cuttings in the tumbling solution, thus keeping work surface and abrasive media free from action-retarding accumulations.	For use in conventional tumblin equipment, it enables a hig finish to be produced on metand plastics.				
Vinyl Primer	Tygorust	It adheres to rusted steel, damp or dry, and can be used with any type of finish coating—particularly vinyl resins.	Applied by brushing, sprayin or dipping, it dries hard and cobe overcoated.				
Cutting Fluid	Ucon Cutting Fluid H-660	A synthetic compound that forms a clear solution in water at room temperature. It can be rinsed from metal surfaces with cold water or vaporized in high-temperature, heat-treating operations. Fluid left on parts provides a rust-protective coating.	Used in drilling, grinding, tap ping, turning, sawing, milling punching, and drawing stainless steel, carbon steel, chrome-molyb denum and other alloy steels aluminum, and phosphor bronze				
Stainless Steel	USS 17-TV	Has a rate of expansion and contraction which parallels that of glass. Is easy to form and strong enough to withstand the pressures caused by the vacuum inside a television tube.	For the commercial manufactur of larger, lower cost, more du able television picture tubes.				
Plastic Synthetic Finish	VB 248	This black finish provides a coating that will adhere to highly polished stainless steel, thereby eliminating light reflection and glare.	Used for dulling reflecting staces of stainless steel in guid missiles, aircraft instrumen and other apparatus.				

Review of Some Recently Developed Materials-Continued

MATERIAL	TRADE NAME	PROPERTIES	APPLICATIONS				
Strippable Plastic Finish	VC-12	This vinyl finish is available in clear and diluted clear colors and provides protection against corrosion and abrasion. It sets to touch in fifteen minutes and dries hard overnight. This finish may easily be pealed off all non-porous surfaces in sheet-like form.	May be applied by spraying of brushing to all metal or wood surfaces. Uses include the temporary masking of objects during manufacturing operations a in the automobile appliance in dustries and the lining of pain spray booths in factories.				
Anti- corrosion Primer	Vorac H-400	A gine chromate compound which produces an anti-corrosive and adhesive coating when applied to clean surfaces.	Applied by dipping, brushing, or spraying, it dries in less than thirty minutes and can be covered by practically all types of coatings.				
Corrosion Inhibitor	VPI 220 VPI 260	These crystals are slightly volatile at atmospheric temperatures and give off vapors that protect all surfaces of the metal with which the crystals may be packaged.	To prevent corrosion in aircraft engines, precision instruments tools, and dies.				
Hard- facing Rod	Wallex	A rod which resists abrasion, as well as exhibiting impact and corrosion resistance. It is easily welded.	Available in 8- to 12-inch length in diameters of 3/16, 1/4, an 5/16 inch. Used for conveyoparts, rolling mill guides, drag chain idlers, etc.				
Water- shedding Compound	Water Displacement Liquid No. 51	A liquid of low-density designed to dis- place water films from the surface of any metal thus effecting rapid, stain-free dry- ing. The film is compatible with most rust-proofing and lubricating oils.	This compound is used to dr metal parts by the water dis placement method. The result ing film can be removed by vapo or liquid solvent degreasing in need be.				
Cold Galvanizing Compound	Zinkrich	When applied to steel or iron surfaces, creates an electro-chemical union, allowing zinc to become galvanized to the base metal.	May be applied by brush, electric spray gun, or cold dip. Appli- cable for industrial, farm, home, and military purposes.				

Names and Addresses of Manufacturers of Products Listed

- A3A—Dynakon Corpn., Cleveland 3, Ohlo.
- Ace Drill Rod Ace Drill Corpn., Adrian, Mich.
- Acme Nos. 2-L-177, 2-L-178—Hanson-Van Winkle-Munning Co., Matawan, N. J.
- Alcoa Utilitube Aluminum Co. of America, Pittsburgh 19, Pa.
- Alhead Allegheny Ludium Steel Corpn., Oliver Bldg., Pittsburgh 22,
- All-State No. 3 All-State Welding Alloys Co., Inc., White Plains, N. Y.
- Alumox 44—Enthone, Inc., 442 Elm St., New Haven 2, Conn.
- Anaerobic Permafil—Chemistry Div., General Electric Research Laboratory, Schenectady 5, N. Y.

- Anchorite 100—Octagon Process, Inc., 15 Bank St., Staten Island 1, N. Y.
- Aqua-Off-Chemclean Products Corpn., 58 Watts St., New York 13, N. Y.
- Archer-Daniels-Midland Stripping Oil
 —Archer-Daniels-Midland Co., 2191
 W. 110th St., Cleveland, Ohio.
- Armstrong Adhesive A-6-Armstrong Products Co., Box 1, Warsaw, Ind.
- Atcenate Atcenate, Inc., North Quincy, Mass.
- Atmosand Marlyn Chemical Co., Calumet City, Ill.
- Base VC-38 United Lacquer Mfg. Corpn., 1001 W. Elizabeth Ave., Linden, N. J.
- Bearing Blue Dayton Rogers Mfg. Co., 2828 13th Ave. S., Minneapolis 7, Minn.

- Birdsboro 30—Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.
- Blue Magic Compounds Nos. O-221, 1 (Double Strength), C-S, and S-12—Blue Magic Chemical Specialties Co., 2135 Margaret St., Philadelphia 24, Pa.
- C-5 Cutting Compound—Felt Products
 Mfg. Co., 1504 Carroll Ave., Chicago
 7. Ill.
- Carclad Bakelite Div., Union Carbide & Carbon Corpn., 30 E. 42nd St., New York 17, N. Y.
- Carilloy T1 Carnegie-Illinois Steel Corpn., Pittsburgh 30, Pa.
- Carpenter B and Carpenter C—Alloy Tube Div., Carpenter Steel Co., Union, N. J.
- Carpenter Corium-Bearing Alloys Carpenter Steel Co., Reading, Pa.

Review of Some Recently Developed Materials - Continued

Names and Addresses of Manufacturers of Products Listed

- Certified Rust Inhibitor No. 425— United Laboratories, Inc., 16806 Euclid Ave., Cleveland, Ohio.
- Chase Tellurium Copper—Chase Brass & Copper Co., Waterbury 20, Conn.
- Chrome-Flo Hanson-Van Winkle-Munning Co., Matawan, N. J.
- Cool-O-Lube Air Conversion Research Corpn., 4107 N. Damen Ave., Chicago 18, Ill.
- Copper-Silver Bronze—Handy & Harman, 82 Fulton St., New York 38, N. Y.
- Cor-In-Organic Products Co., Irving, Tex.
- Cosmolube E. F. Houghton & Co., 301 W. Lehigh Ave., Philadelphia 33, Pa.
- Cupralum—Knapp Mills, Inc., 23-15 Borden Ave., Long Island City, N. Y.
- Cut-Cool Organic Products Co., Irving, Tex.
- Dayton-Rogers Die Lubricant—Dayton Rogers Mfg. Co., 2828 13th Ave. S., Minneapolis 7, Minn.
- Dekoron-Samuel Moore & Co., Mantua. Ohio.
- Desegatized Steels—Latrobe Steel Co., Latrobe, Pa.
- Divco No. 229 Division Lead Co., 837 W. Kinzie St., Chicago, Ill.
- DoAll Ground Stock—DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
- Dow Corning 7 Emulsion, Mold Release Emulsion No. 35, and No. 7 Compound—Dow Corning Corpn., Midland, Mich.
- Durpon Series-Nopco Chemical Co., 15 Essex St., Harrison, N. J.
- Dymo-C-Abrasives Div., Elgin National Watch Co., Elgin, Ill.
- Dynakleen—Du-Lite Chemical Corpn., Middletown, Conn.
- Dynakon-F and G1A Dynakon Corpn., Cleveland 3, Ohio.
- EC-1168—Adhesives & Coatings Div., Minnesota Mining & Mfg. Co., 411 Piquette Ave., Detroit 2, Mich.
- ElectroShield—American Cladmetals Co., Carnegie, Pa.
- Emulsifier STH—General Aniline & Film Corpn., 22 Center Square, Easton, Pa.

- Enthone Solder Stripper Enthone, Inc., 442 Elm St., New Haven 2, Conn.
- Enthox-Enthone, Inc., 442 Elm St., New Haven 2, Conn.
- Extrudite—Detrex Corpn., Box 501, Detroit 32, Mich.
- Ferrolum Knapp Mills, Inc., 23-15 Borden Ave., Long Island City, N. Y.
- Flexicast—Engineers Specialties Div., 10 Edna Place, Buffalo, N. Y.
- FO-106 Aviation-Industrial Chemicals Div., Fine Organics, Inc., 211 E. 19th St., New York, N. Y.
- Form-A-Jig—Eutectic Welding Alloys Corpn., 40-40 172nd St., Flushing, N. Y.
- Formbrite American Brass Co., Waterbury 20, Conn.
- Fused Stabilized Zirconia Norton Co., Worcester 6, Mass.
- G-E 12353, G-E 81223, and G-E 81267 —General Electric Co., Pittsfield, Mass.
- Geon 404-B. F. Goodrich Chemical Co., Cleveland, Ohio,
- Grade 608 Chrome Carbide—Carboloy Dept. of General Electric Co., 11147 E. 8 Mile Road, Detroit 32, Mich.
- Graph-Mo Hollow-Bar—Steel & Tube Div., Timken Roller Pearing Co., Canton 6, Ohio.
- GRC Rivets Gries Reproducer Corpn., 780 E. 133rd St., New York 54, N. Y.
- Gritcloth—Bay State Abrasives Products Co., 15 Union St., Westboro, Mass.
- Gulf Lasupar Cutting Oils and Gulf No-Rust No. 6—Gulf Oil Corpn., Pittsburgh 30, Pa.
- HAE Pitman Dunn Laboratory, Frankford Arsenal, Philadelphia,
- Hard'N'Tuff-Doughty Laboratories, 299 Madison Ave., New York, N. Y.
- Heat-Rem—Speco, Inc., 7312 Associate Ave., Cleveland 9, Ohio.
- Hevimet—Carboloy Dept. of General Electric Co., 11147 E. 8 Mile Road, Detroit 32, Mich.
- Hydrodyne—Aquadyne Corpn., 220 E. 42nd St., New York, N. Y.

- Incoloy-International Nickel Co., 67 Wall St., New York 5, N. Y.
- Insurok Grade T-815—Richardson Co., Melrose Park, Ill.
- Ion-Kote—DuBois Co., Cincinnati 3,
- Isopac—Denfis Chemical Laboratories, Inc., 172 Pacific St., Brooklyn, N. Y.
- Kemisol A—Wayne Chemical Products Co., Copeland and MCRR, Detroit 17, Mich.
- Klem-Kote Klem Chemicals, Inc., 14401 Lanson Ave., Dearborn, Mich.
- Kling-Oil-Magnus Chemical Co., Inc., Garwood, N. J.
- Lankote PR-1 J. Landau Co., 221 Wooster St., New York 12, N. Y.
- Leaded TS 4140 Modified—La Salle Steel Co., 1412 150th St., Hammond, Ind.
- Leafcote Mid-America Steel Warehouse, 1000 W. 50th St., Chicago,
- Led-Plate Armite Laboratories, 66 S. Broad St., Los Angeles, Calif.
- Liqui-Moly, Liqui-Moly NV, Moly-Wax-Stix—Lockrey Co., Lubricants Div., College Point, N. Y.
- Lubri-Cut—Tap & Drill E-Z Corpn., Inglewood, Calif.
- Magnus 751; Cutting Compounds Nos. 6, 7, DO-1A, DO-4A; and D-Scale-RW—Magnus Chemical Co., Inc., Garwood, N. J.
- Masonite Die Stock-Masonite Corpn., 221 N. La Salle St., Chicago, Ill.
- Metalloid X-30 Metalloid Corpn., Huntington, Ind.
- Metal Stripper N-165—Enthone, Inc., 442 Elm St., New Haven 2, Conn.
- M.H.C.—Glenn L. Martin Aircraft Co., Baltimore 3, Md.
- Mo-braze American Electro Metal Corpn., 320 Yonkers Ave., Yonkers 2. N. Y.
- Nicrobraz Wall Colmonoy Corpn., 19345 John R St., Detroit, Mich.
- Northwest Addition Agent No. 230 and Emulsion Cleaner No. 3—Northwest Chemical Co., 9300 Roselawn Ave., Detroit 4, Mich.

Review of Some Recently Developed Materials - Continued

Names and Addresses of Manufacturers of Products Listed

- Nox-Rust 310-AC—Nox-Rust Chemical Corpn., 2425 S. Halstead St., Chicago 8, Ill.
- No. 4-S-10—Hanson-Van Winkle-Munning Co., Matawan, N. J.
- No. 37 Aluminum Solder Rod All-State Welding Alloys Co., Inc., White Plains, N. Y.
- No. 39 Brazaloy Flux—All-State Welding Alloys Co., Inc., White Plains, N. Y.
- No. 140 Stik-Wax—S. C. Johnson & Son, Inc., Racine, Wis.
- No. 155 Premium—All-State Welding Alloys Co., Inc., White Plains, N. Y.
- 8000 Tool Plastic—Durez Plastics & Chemicals, Inc., North Tonawanda, N. Y.
- Oakite Compound No. 31 Oakite Products, Inc., 126 Rector St., New York 16. N. Y.
- Parco Black-Parker Rust Proof Co., 2177 E. Milwaukee, Detroit 11, Mich.
- Parker Compound 90—Parker Appliance Co., 17325 Euclid Ave., Cleveland 12. Ohio.
- PCA-100 & 101—Paint Corporation of America, Fidelity Bldg., Cleveland 14, Ohio,
- Pennsalt SR-4 Pennsylvania Salt Mfg. Co., 49 Lea, Whitemarsh, Philadelphia, Pa.
- Petrobase 210—Pennsylvania Refining Co., Butler, Pa.
- Phenopreg LP-502 Fabricon Products, Inc., River Rouge, Mich.
- Phospray-Du-Lite Chemical Corpn., Middletown, Conn.
- Plastilock-B. F. Goodrich Co., Akron, Ohio.
- Powerfilm Thomas Co., Chemical Coatings Div., Minneapolis 3, Minn.
- PresSint Pre-Forms—PresSint Products, Lyndhurst, Ohio.
- Prestem-Heppenstall Co., 4624 Hatfield St., Pittsburgh 1, Pa.
- Protecto-Cote Chemclean Products Corpn., 58 Watts St., New York 13, N. Y.
- Pydraul F-9—Monsanto Chemical Co., St. Louis 4, Mo.
- Q200—Barco Chemical Products Co., 701 S. La Salle St., Chicago, Ill.

- Quick-Set-Rezolin, Inc., 4825 W. Jefferson Blvd., Los Angeles 16, Calif.
- RC-55, 70, 130-A, and 130-B—Rem-Cru Titanium, Inc., c/o Crucible Steel Co. of America, Midland Works, Midland, Pa.
- Rustclean 12 and 15—Octagon Process Inc., 15 Bank St., Staten Island 1, N. Y.
- Rust-Cure Monroe Co., Inc., 10703 Quebec Ave., Cleveland 6, Ohio.
- Rustshield 2—Octagon Process, Inc., 15 Bank St., Staten Island 1, N. Y.
- Saf-philm Swan Finch Oil Corpn., 30 Rockefeller Plaza, New York, N. Y.
- Schieren Duxbak Rayon Core Charles A. Schieren Co., 30 Ferry St., New York, N. Y.
- Seal-All Allen Products Corpn., 20450 Sherwood Ave., Detroit 34, Mich.
- Sheffield Super-Hot—Sheffield Bronze Paint Corpn., 17814 Waterloo Road, Cleveland 19, Ohio.
- Silver-Clad Steel—Rolled Plate Div., American Silver Co., Inc., 3607 Prince St., Flushing, N. Y.
- Simonds Air-Hardening Die Steel Simonds Saw & Steel Co., Fitchburg, Mass.
- Smoothex Brightener Process Gill Corpn., 5317 St. Clair Ave., Cleveland, Ohio.
- Sprabond Metallizing Engineering Co., Inc., 38-14 30th St., Long Island City, N. Y.
- ST-20N, ST-25, ST-30 Federated Metals Div., American Smelting & Refining Co., 120 Broadway, New York, N. Y.
- Stalwart Nos. 161 and 808—Stalwart Rubber Co., Bedford, Ohio.
- Star Etch Silver Star Chemical Corpn., 58 Watts St., Ne v York 13, N. Y.
- Starrett No. 497 Air-Hardening Flat Stock-L. S. Starrett Co., Athol, Mass.
- Steel Tubing, Highly Finished—Tube Reducing Corpn., Wallington, N. J.
- Stop-Rust No. 0 Special Stop-Rust Co., Chattanooga, Tenn.

- Super La-Led—LaSalle Steel Co., 1412 150th St., Hammond, Ind.
- Super-Mul—DuBois Co., Cincinnati, 3. Ohio.
- Super Samson-Carpenter Steel Co., Reading, Pa.
- Tarlac—Flash-Stone Co., Inc., 30 E. Rittenhouse St., Philadelphia 44, Pa.
- Ten Series—Forbex Corpn., 125 Broad St., New York 4, N. Y.
- Tensilend 100 (Grade 230) and Tensilend 120 (Grade 260) Arcos Corpn., Philadelphia 43, Pa.
- Tool-Saver—DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
- Tran-Cor T-O-S—Armco Steel Corpn., Middletown, Ohio.
- Transultex Grades A, A-1, and B— Texas Co., 135 E. 42nd St., New York 17, N. Y.
- Triple-Chip Soluble Oil Motch & Merryweather Machinery Co., 715 Penton Bldg., Cleveland 13, Ohio.
- Tuff-Kut-Lubricants, Inc., 908 Fisher Bldg., Detroit, Mich.
- Tumb-L-Magic Tumb-L-Matic, Inc., 4510 Bullard Ave., New York 70, N. Y.
- Tygorust U. S. Stoneware Co., Akron, Ohio.
- Ucon Cutting Fluid H-660—Carbide & Carbon Chemicals Co., Div. of Union Carbide & Carbon Corpn., 30 E. 42nd St., New York 17, N. Y.
- USS 17-TV Carnegie-Illinois Steel Corpn., Pittsburgh 30, Pa.
- VB 248 and VC-12—United Lacquer Mfg. Corpn., 1001 W. Elizabeth Ave., Linden, N. J.
- Vorac H-400-Vorac Co., Rutherford, N. J.
- VPI 220 and 260—Shell Oil Co., 50 W. 50th St., New York 20, N. Y.
- Wallex—Wall Colmonoy Corpn., 19345 John R St., Detroit, Mich.
- Water Displacement Liquid No. 51— Enthone, Inc., 442 Elm St., New Hayen 2, Conn.
- Zinkrich Chase Chemical Corpn., 40 W. 29th St., New York, N. Y.

Designing Jigs for Multiple-Spindle Drilling

By FRANK G. ZAGAR Vice-President and General Manager Zagar Tool, Inc., Cleveland, Ohio

RILLING is probably the most common of all machining operations, possibly having its origin when man first put a hole in a stone and fitted it with a handle. Even today, however, if ten tool designers were all given the job of designing a jig for drilling a number of holes in the same part, there is no doubt but that the design of every jig would be different. Yet out of these ten designs only one would be the best—best from the standpoint of being practical, easiest to manufacture, and least expensive.

As a manufacturer of multiple-spindle equipment over a period of years, Zagar Tool, Inc., Cleveland, Ohio, has seen many fixture designs, both of our own design and those of our customers'. As a result, we have some definite ideas about how jigs for multiple-spindle operations should be designed and used. All of our experience has been with gearless drill heads of the fixed spindle type, Fig. 1, which are frequently required for drilling many holes in one small pattern. However, most of the design practices here suggested are equally as practical for geared or adjustable spindle drill heads as they are for gearless types.

A problem that frequently confronts the tool or the process engineer is the question of when to use multiple-spindle operations. Such operations should not be used unless they result in a definite saving. The total number of holes that will have to be machined should be counted, and, unless they require more than two days of production time per month, the regular single-spindle operations should generally be specified. It is, on the whole, cheaper to let a drill press operator spend two days a month drilling holes than it is to have special tools made that will do the job in a few hours.

Most applications of multiple-spindle operations are clearly essential—for example, on large parts where handling is a prime consideration, or small parts which have many holes in each piece, or a number of parts where each has a few holes. It has been found that the following kinds of products are usually suitable for multiple-spindle machining: cameras, office machinery, automotive parts, aircraft parts, gas burners, home appliances, wood products, plastics, and die-castings. Practically all of these products are repetitively produced for home or industrial consumption.

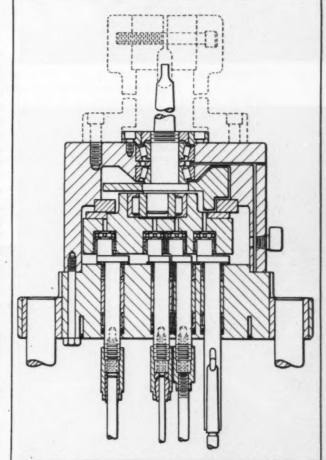


Fig. 1. Cross-sectional drawing of a typical gearless, multiple-spindle drill head having fixed center distances between drills

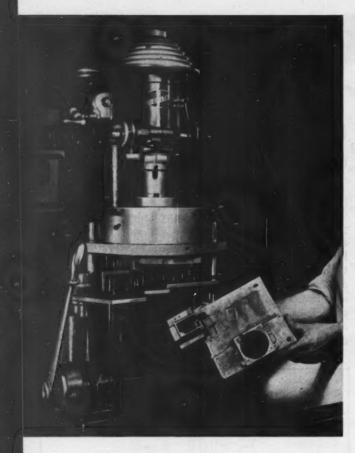




Fig. 2. Standard drill press equipped with a multiple-spindle drill head and a pump type workholding jig for drilling the die-casting shown.

Multiple-spindle operations have been most widely used in automotive production. It is only natural that this class of work should be handled on multiple-spindle machines, primarily because of the size of motor blocks, housings, and similar parts, and the difficulty encountered in handling them on single-spindle machines—and because of the large quantities involved. Most multispindle operations in automotive plants are performed on special machines built for one job.

Only in recent years has the multiple-spindle drilling of smaller items, such as camera parts, radio frames, and typewriter carriages, become a production reality. Past practice in machining such parts has been to use large numbers of light single-spindle drill presses, equipped with tumble type jigs. When the handling of parts is not too much of a task, it is a natural impulse to use single-spindle methods. However, the present cost and scarcity of labor make multi-spindle drilling operations of small and medium-size work more desirable.

Thrust and Torque Requirements

After determining the feasibility of multiplespindle operation, the next considerations are the number of holes to be machined at one time and the thrust and torque requirements. The number of holes to be drilled at one time is very often limited by the capacity of the drill press available. If the capacity is not sufficient to drill all of the holes at one time, it may be necessary to use special-purpose equipment or modify the standard drill press for multiple-spindle work.

Many multi-spindle drilling operations are performed on standard light-duty drill presses, such as the one seen in Fig. 2. Any lack of horse-power to meet torque requirements on such machines can be overcome by substituting a larger motor. However, the frames of such standard single-spindle drill presses are sometimes not rigid enough to withstand the heavy thrust loads of multiple-spindle drilling without some extra bracing. Considerably more break-through surge leading to excessive drill breakage is caused when drilling a large number of small holes at one time. On jobs requiring the drilling of a great number of small holes—such as gas-burner

Fig. 3. A four-post, ram type hydraulic machine is employed for multiple-spindle drilling of gasburner plates to avoid excessive drill breakage

180-MACHINERY, November, 1952

Fig. 4. Tumble type jig and multiple-spindle head used for drilling both flanged ends of part in jig, and the three flanges on the work-piece at left

plates—a four-post, ram type hydraulic drilling machine is often desirable, as shown in Fig. 3.

Thrust requirements of multiple-spindle operations are greater than is generally believed. For example, in drilling twenty 1/8-inch diameter holes, the total area drilled is 0.0123 square inch times 20, which equals 0.246 square inch—or the equivalent of a little less than a 9/16-inch diameter drill. However, the web of a 9/16-inch drill is approximately 0.075 inch thick, whereas the combined web thickness of twenty 1/8-inch drills is approximately 0.425 inch. Hence, the thrust requirement for the twenty 1/8-inch drills is more than five and one-half times as great as the thrust required for a single 1/2-inch drill. Still, both remove approximately the same amount of stock.

Four Basic Types of Drill Jigs

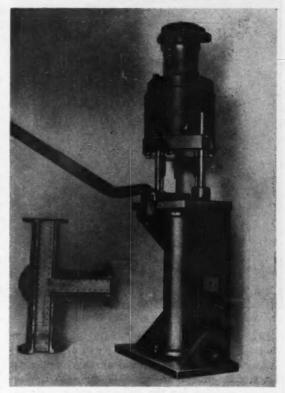
There are four basic types of drill jigs:

1. Tumble type jigs, which consist of either one top plate with a set of legs, or a box type jig with bushings on more than one side. Such a jig, with a multiple-spindle drilling head, is illustrated in Fig. 4. This jig is used for drilling both flanged ends of the part shown in the jig, and the three flanges on the part seen at the left.

2. Pump type jigs, similar to the one shown in Fig. 2.

3. Spring plate type jigs, wherein the bushing plate serves as a clamping member through the action of springs. One such jig is seen mounted on a turret lathe in Fig. 5.

4. Indexing type jigs, where the work-pieces are loaded at one station and are indexed until



they pass through a number of positions to progressively drill all the holes. A seven-station indexing jig is shown in Fig. 6.

Tumble type drill jigs are regularly used on single-spindle drilling machines. As a rule, they are light, and in order to adapt them to multiple-spindle work, they need to be revamped. It is usually easy to align one drill with a single hole, but when several drills must enter their respective bushings perfectly, then some external provisions have to be made to center the drill head with the jig prior to the entrance of the



Fig. 5. In this unusual lathe setup, a multiple-spindle drill head is mounted on the headstock and a spring plate jig on the turret.



the drilling machine. The drill head should be fastened to the drill press spindle, and held in

Fig. 6. In this jig, the work is indexed successively to seven stations to complete the drilling of all holes required.

drills. This can be done by adding an extra hole to two sides of the jig for the entry of drill head leader pins. The leader pin arrangement must be sturdy enough to shift the jig into the required position for the drills to enter their respective bushings.

Another method of alignment is to place positive stops on the drill press table, so that the drill jig is definitely located. In this way, the drills will enter their respective holes with no deflection. In a set-up of this kind, it is also advisable to hold the drill head firmly in position with relation to the column of the drill press. This can be done by means of extra drill bushings and guiding dowel-pins. Tumble type drill jigs can also be employed on a drill press table equipped with a guide rail. The latter set-up is practical when using one drill head for each face of the drill jig. The drill jig can be slid along the table while being held against the rail, thereby effecting real time savings in drilling and tapping.

Tumble type jigs are usually the least expensive in converting from single-spindle to multiple-spindle operations. If the procedure outlined is adhered to, there will be a minimum of trouble. If, however, this procedure is not followed, drills may break and the drill bushing wear may be excessive. Also, the holes drilled will not be straight or accurately positioned, and the entire set-up may vibrate.

The use of universal or pump type drill jigs, although sometimes more costly, is probably the most positive way of drilling holes. Such jigs should be fastened permanently to the table of position with relation to the drill jig, by means of leader pins and bushings.

Pump type jigs, although the most positive and foolproof, are apt to be somewhat slower to use, owing to the need for manual clamping and unclamping of the work. Also, some inaccuracies may result when it is necessary to shift the part from one jig to another for drilling more than one face. There is, too, a dependence upon locating points, which is not normally the case in tumble type drill jigs.

In movable bushing or spring plate type jigs, the action of the springs and drill press clamps the part into place. This type jig is very popular, and is probably the most rapid in operation, inasmuch as the operator does nothing else but handle the parts and, if the drill press has an automatic feed, start the cycle. Here again, the set-up should be rigidly aligned by means of leader pins.

Indexing type jigs present many drilling problems. Such jigs are not always extremely accurate, as there are fit, location, and indexing errors, all of which make it necessary to specify more liberal tolerances on the work-pieces being produced. For improved accuracy, it is desirable that the drill bushings be carried around with the part so that the relationship between the bushings and the part being drilled is constant. Most of the time, however, space limitations in indexing set-ups rule out this sort of bushing arrangement. Then, bushing inserts, each having a number of holes, can be used.

If neither of these methods is practical, individual bushings must be provided at each station, depending on the job being performed. This method does have its advantages, since the drills remain in their respective bushings at all times and the cycle time of the job is thus decreased. In such cases, it is not always necessary to provide a rapid approach of the drills to the work, and the cycle can generally be limited to a feed stroke only.

Points to be Considered in Designing Drill Jigs

Points of location should be in or on the same jig component as the bushings whenever possible. In this way there will be no accumulative error between sliding parts. However, if the locators for the part being drilled must be in the base of the fixture, and the drill bushings in

the top plate, then the relation of the top plate and the bottom plate must be maintained by guide pins. Any tilting of the guide pins, or too much clearance, will throw this relationship off, particularly if the part is high or unwieldy.

In the spring plate type of multiple-spindle drill jig shown in Fig. 7, the rough work locators A are secured to the baseplate B of the jig, while the final locators C are secured to the under side of bushing plate D. Leader pins E are pressed into the baseplate of the jig and project through bushings in the bushing plate and drill head F.

Provision should be made for the bushing plate to stop at a predetermined point, so that it will be parallel to the work. Stop-pins are shown at G in Fig. 7. When the bushing plate is used as a clamping member, irregularity of the parts may cause cocking. It is better, therefore, to have the bushing plate stop at a predetermined point and to have separate spring plungers, such as the one shown at H, hold the work-piece X in place. Obviously, the combined resistance of these plungers must be less than the resistance of the upper springs.

While this method of clamping is fast, there are instances where it cannot be used, due to the shape of the part or for other reasons. In such cases, the part can be clamped separately to the base of the drilling fixture with quick-action toggle clamps, sliding clamp members, or any other suitable arrangement. Clamping should be done on the outside edges of the fixture base, which should be relieved in the center and made of ample proportions to withstand distortion. Any distortion in the fixture base will create a corresponding misalignment of the leader pins.

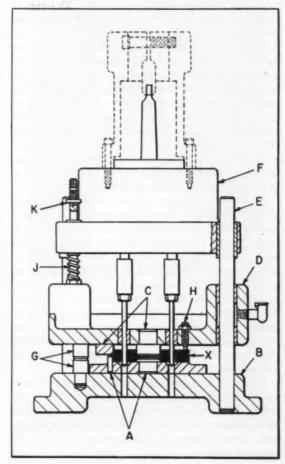
Bushing plates should be suspended from below the drill head by means of hold-up pins J, Fig. 7. Good design practice is to have the hold-up pins permanently locked in the bushing plate and passing freely up through the baseplate of the drill head. The top portions of the hold-up pins should contain a series of cross-pin holes for adjustment. When drills have to be changed or sharpened, the cross-pins K are removed and the drill bushing plate is dropped, thus making the drills accessible. Such a set-up is reasonably trouble-free and easy to use.

Drill bushings must either be in direct contact with the work, or have ample clearance to provide room for the disposal of chips. This is particularly true for small holes. When drilling holes 1/8 inch in diameter or smaller, it is almost

Fig. 7. Spring plate type of multiple-spindle drill jig in which rough work locators (A) are mounted on baseplate (B), while final locators (C) are held on bushing plate (D).

impossible for the chips to come up through the bushing without causing considerable trouble—usually breakage of the drills. This difficulty is probably due to web thickness. Since the web of a 1/8-inch diameter drill is more than 1/64 inch wide, and the web of a 1-inch drill is approximately 1/8 inch wide, it can be seen that there is considerably more room for chips in proportion to size in larger drills. Besides, a slower feed is employed on larger drills, and the chips have more opportunity to escape. A good rule of thumb is to make the bushing clearances four times the thickness of the drill web.

When a job requires the drilling of a hole in a pocket or recess lower than the face of the part, designers often have a tendency to use long bushings, the bores of which are countersunk or relieved for a considerable portion of their length. It is recommended that such bushings be used only when it is absolutely necessary, and when there is not enough clearance for a boss on the bushing plate to fit down into the part. Two reasons why countersunk bushings are not desirable are that they lessen effective drill life, and that they are not standard.



Selecting and Applying

In This, the Second of Three Articles on the Lubrication of Plain and Anti-Friction Bearings, the Application and Selection of Lubricants are Described. Some of the Causes and Remedies for Bearing Failure are also Discussed.

By LEE BALLARD
Tide Water Associated Oil Co.
New York, N. Y.

PLAIN bearings are commonly lubricated with grease. Hand application is usually confined to half-bearings with open tops, the grease being packed manually so as to coat the journal evenly. Retainers may be required to hold the grease in place, but where they are not practicable, wool yarn will be found satisfactory. Hand packing, unless expertly performed, is generally unreliable and wasteful.

Another method of applying grease is by means of a screw-down grease cup. The cup is filled with grease, and when screwed down over its fitting, forces the lubricant into the bearing. A third method employs grease guns. These are hand- or air-operated devices which force the grease through a pressure type fitting into the bearing area. A check-valve in the fitting prevents the grease from leaking out, after the gun has been removed. This last method is widely used for all types of bearings. Applying grease either through screw-down grease cups or pressure fittings is an improvement over hand packing, in that the old contaminated grease is forced out of the ends of the bearings.

Spring-compression grease cups of the type illustrated in Fig. 1 are so designed that a coiled spring acting on a leather-packed plunger gradually forces the grease into the bearing. The rate and quantity of feed can be controlled by adjusting the spring pressure and the size of an orifice leading to the bearing. A pressure fitting is usually installed for filling the cup. Application of grease by means of spring-compression grease cups has a decided advantage over the three previously mentioned methods, in that the cups require attention only when the supply of grease has been consumed.

Centralized pressure greasing systems embody an air- or mechanically-operated pump which forces grease through piping to a number of bearings. Most of these systems have adjustable valves located at each bearing to control the flow of grease.

Large cavities in bearing caps, called "wells," are designed to retain a supply of grease. If properly packed, they provide an efficient means of lubrication for bearings of shafts carrying heavy loads at low speeds. Wool yarn or burlap is placed tightly against the walls of the well and packed to make it ride on the shaft, the center of the well then being filled with a soft grease. The well should be kept carefully covered to exclude dirt and other foreign matter. Block grease can also be used in the well. The block grease rides the shaft, and no wool yarn or burlap packing is required.

In selecting a lubricant, it is necessary to consider the bearing size, speed, unit pressure, operating temperature, and method of application. Bearing size influences the viscosity, or consistency, of the lubricant. For example, for a large bearing the lubricant must be sufficiently fluid to spread over a large area, and at the same time, sufficiently viscous to remain on the bearing and not run off at any one point. Bearing clearance increases with the size of the bearing and, as a general rule, large bearings require a more viscous lubricant than small bearings.

Speed is a factor in the formation and maintenance of the lubricating film because of the pumping action produced by a revolving journal. High speeds are favorable to the formation of relatively thick films and thereby permit the use of less viscous lubricants than do low speeds, where the hydraulic pressure in the film is less. The use of a lubricant of higher viscosity than is required will cause a rise in bearing temperature because of the unnecessarily high fluid friction that results.

Bearing pressure affects the thickness of the film, inasmuch as high pressure tends to squeeze the lubricant out and reduce the film thickness. Therefore, other conditions being the same, heavily loaded bearings require a more viscous lubricant than lightly loaded ones. The drawings in Fig. 2 show what happens to the oil film

Lubricant to Plain Bearings

between a loaded surface and a supporting surface when the loaded surface is set in motion. A loaded journal, view A, takes a slightly eccentric position in its bearing, as is apparent by the wedge shape of the oil film cross-section. The oil film cross-sections are also seen in view B, where a loaded plate is sliding over shoes which are free to tilt; in view C, where a loaded plate is sliding over a table; and in view D, where a thrust collar rotates over segments which are stationary.

The viscosity of the lubricant will be directly affected by the temperature to which the bearing is subjected, a high temperature tending to reduce the film thickness. Where high bearing temperature can be traced to some source other than fluid friction, such as radiated or conducted heat, a more viscous lubricant is required. Finally, the method of application of the lubricant also determines both its viscosity and its quality. For example, if the grease is to be applied with a hand-operated gun, it must generally be soft—not over No. 2 N.L.G.I. (National Lubricating Grease Institute) grade.

Babbitt is used extensively for many types of plain bearings found in industrial equipment. The original, or genuine, babbitt had fifty parts tin, five parts antimony, and one part copper. Modern babbitt differs somewhat from genuine babbitt in the proportions of tin, antimony, and copper used, and also contains varying proportions of lead, depending on the required service of the metal.

Among the properties possessed by bearing metals should be mechanical strength, good surface finish, "embeddability," and conformability. ("Embeddability" pertains to the ability of the metal to permit hard foreign particles to be pressed flush into its surface, and "conformability" to its ability to flow slightly to adapt itself to the alignment of a shaft.) Soft metals, such as lead and tin, although good in surface finish, "embeddability," and conformability, are low in mechanical strength. This deficiency can be overcome by alloying these metals with harder metals.

Most tin- and lead-base babbitts tend to lose their strength rapidly at elevated temperatures, and for this reason alloys of copper and lead, cadmium and silver, cadmium and nickel, lead hardened with alkali, and alkali-earth metals are used on some internal combustion engines where the temperatures and pressures are such that tin-base metals are not satisfactory. These alloy bearings are not used to any appreciable extent in general industrial machinery.

Bronze is occasionally used in industrial equipment where the bearing pressures are high but the rubbing speeds and operating temperatures are moderate. Non-metallic bearings made of Bakelite, fabric, fibrous materials impregnated with phenolic compounds, laminated plastics, and lignum vitae or other hard woods are used to some extent in industrial machinery, particularly as roll-neck bearings in rolling mills. These bearings have good anti-friction properties when water-lubricated.

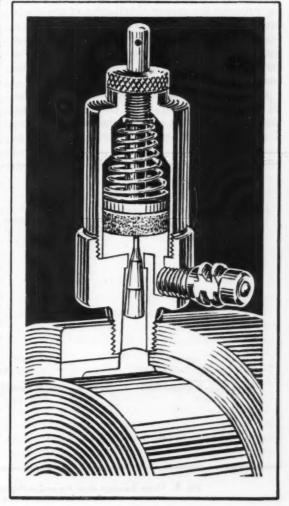


Fig. 1. This spring-compression grease cup requires attention only when the supply of grease has been consumed.

Although water lubrication is in most instances satisfactory, experience has shown that adding a small amount of lubricating grease (applied by any convenient method) to the water will eliminate corrosion, decrease the coefficient of friction, and increase bearing life. There is further evidence that grease used in conjunction with water provides a secondary defense against hot spots if the water film fails momentarily. In some instances, oil is used with water, and where this is the practice, a compounded oil of the marine engine oil type that will emulsify with water should be used. In selecting a suitable grease for a composition bearing, the same grease that would be selected for a plain bearing operating under identical conditions is recommended.

Bearing failure can ordinarily be attributed to improper design or installation, faulty operating conditions, or improper lubrication practice. Difficulties due to improper design or installation include incorrect grooving, excessive or insufficient clearance, misalignment, and poor bonding of the bearing metal. Incorrect grooving prevents the proper distribution of the lubricant in the bearing. In the case of grooves in the pressure area, the load-carrying capacity of the bearing is reduced, and instead of assisting to form an oil film over the entire surface of the bearing, the grooves permit the oil to drain.

Excessive bearing clearance will also let the oil escape too rapidly, with the result that an inadequate quantity reaches the pressure area. Too little clearance, on the other hand, may pre-

vent enough oil from entering the pressure area, so that a load-supporting film cannot be formed. Furthermore, in circulating systems where heat must be conducted away by the lubricant, insufficient clearance may prevent enough oil for cooling purposes from entering the bearings. As a general rule, standard clearance for industrial bearings is approximately 0.001 inch per inch of journal diameter, plus an additional 0.001 inch.

Misalignment causes localized high-pressure areas. Although a more viscous oil or grease will aid in improving lubrication, the only satisfactory method of obtaining good performance is to insure that the running parts are in correct alignment.

Bearing failures due to faulty operating conditions include overloading, excessive belt pull, a too-high ambient temperature, and neglect in running-in. Overloading can be caused by a greater load than the bearing can carry, or the load may be within the safe limit of the bearing but greater than can be sustained by the lubricant used. In the first instance, the remedy is to reduce the unit load or install a bearing large enough to carry the existing load. The use of a heavier oil will help such a condition, but it cannot be entirely corrected until the unit load is brought down within safe limits. In the second instance, a lubricant of higher viscosity will usually result in satisfactory operation, although if the load carried is an exceptionally heavy one, it may be necessary to change the method or point of lubrication.

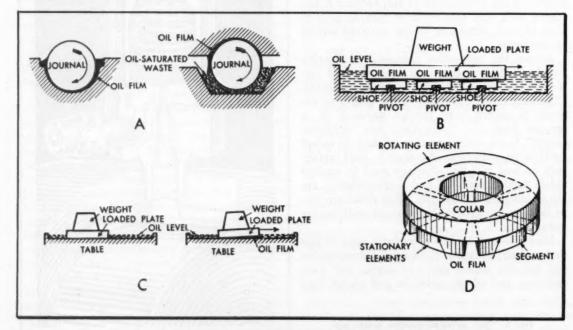


Fig. 2. These drawings show the wedge-shaped oil film developed when a loaded surface is set in motion over a supporting surface.

Excessive side or upward belt pulls are often the cause of overheating, especially with a split bearing, since the area of maximum pressure may then be in a portion of the bearing which is grooved or cut to facilitate the introduction and distribution of the lubricant. Where there is a heavy belt pull at an angle to the vertical, the joints of bearing segments should be located away from the area of maximum pressure. In the case of ring-oiled bearings, a belt pull in an upward direction may prevent the oil brought to the top by the rings from being properly distributed, and thereby produce overheating.

Where bearings operate in an excessively hot atmosphere, or are adjacent to hot areas of a machine, it can be expected that the operating temperature of the bearings will be higher than average. Since heat acts to thin out the film, a relatively viscous lubricant should be used. In the case of grease-lubricated bearings, a high melting point lubricant should be used to prevent excessive thinning.

Neglect in properly running-in and fitting a new bearing is often a cause of premature failure. Where high spots are not sufficiently worn down, or where the fit between the bearing and the journal is incorrect, localized high-pressure areas exist which may produce overheating, scoring, and excessive wear.

Faulty lubrication practice as a cause of bearing failure may be in the form of improper selection or application, or contamination of the lubricant. The use of an incorrect grade or type of lubricant is a common cause of bearing difficulty, and in such cases an analysis of the operating conditions is in order so that a suitable lubricant can be prescribed. The method of lubricant application and the quantity applied are also governed by the operating conditions.

Bearings for line shafting operate satisfactorily with hand oiling, whereas bearings subjected to high speeds and heavy loads require for satisfactory performance that some automatic method of applying the lubricant be used. Where oil is applied by means of a bottle oiler or other slow feeding device, it may be necessary to have more than one point of application in a very wide bearing. The point of lubricant entry into the bearing should be in an area that is not under pressure. Otherwise, flow of the lubricant is restricted, and the formation of a converging oil film impeded.

Lubricant contamination is a common cause of bearing trouble. Dirt in oil will cause the bearing to run hot. Impurities in circulating or splash systems induce sludges to form, and increase the rate of oxidation of the oil.

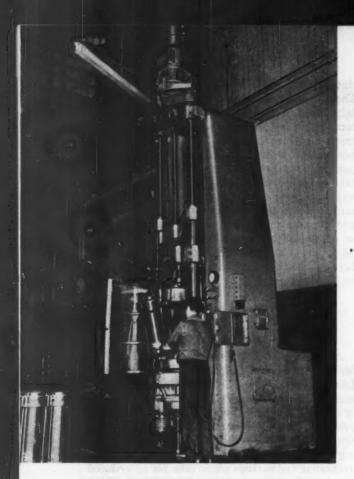
When a bearing overheats in service, temporary measures can be taken to permit continued operation if a shut-down is inexpedient. The application of compounded cylinder oil containing small amounts of fatty oil-such as is commonly used for steam cylinders-or an extreme pressure lubricant will reduce the temperature of a hot bearing, and usually permit continued operation, unless there has already been a complete failure of the bearing. If neither steam cylinder oil nor extreme pressure lubricant reduces the temperature sufficiently, the addition of a small amount of flowers of sulphur or white lead to the oil may be found effective. Also, clearance between the segments of the bearing should be increased by slacking off the bolts or nuts holding the segments together.

New Film on Metallizing

A 16 mm. sound-color film released by the Metallizing Engineering Co., Inc., 38-14 30th St., Long Island City 1, N. Y., presents the fundamentals of metallizing. The film is a composite of on-the-job applications of this metal spraying process as it is used in many branches of industry. Maintenance personnel are shown reclaiming worn or damaged machine parts; other users dramatize the savings made possible by reduced repair costs, reduced "down" time, and simplified inventories of spare parts. How desired service characteristics can be imparted to base metals by a low-cost sprayed coating is also pointed out. Protection of iron and steel equipment and structures from corrosion, for example, can be obtained by metallizing with zinc or aluminum. The motion picture, having a running time of twenty-eight minutes, is available for showing to interested industrial, technical, professional, or educational societies and groups.

Growth of American Steel Industry

Annual raw steel production in the United States at the start of the twentieth century was 11,400,000 net tons. At the beginning of the First World War the figure was 26,000,000, and within a few years leaped to a wartime maximum of 50,000,000. In 1939, a production of approximately 53,000,000 net tons was recorded. Another wartime maximum of 89,600,000 net tons was produced in the year 1944. Late in 1949, annual capacity had been built up to 96,000,000 tons. Further additions and new installations have brought current steel producing capacity to a figure in excess of 110,000,000 net tons per year, and there are plans which could raise it to 120,000,000.



In Shops Around

Camera Highlights of Some Interesting Operations Performed in Various Metalworking Plants throughout the Nation

Time required for casehardening the inside surface of pump cylinder liners has been reduced from more than four hours to only four minutes by means of this automatic induction heat-treating machine installed in the Toledo, Ohio, plant of the National Supply Co. The liners vary in size up to 36 inches in length and 8 1/2 inches in diameter.

(Below) Drilling of guided missile fins at the Santa Monica, Calif., plant of the Douglas Aircraft Co. is done with nineteen Keller "Airfeedrills." Nineteen holes are drilled in one edge of the fin, and seven holes in the other edge, all in thirty-six seconds. Previously, 4.2 minutes was required.

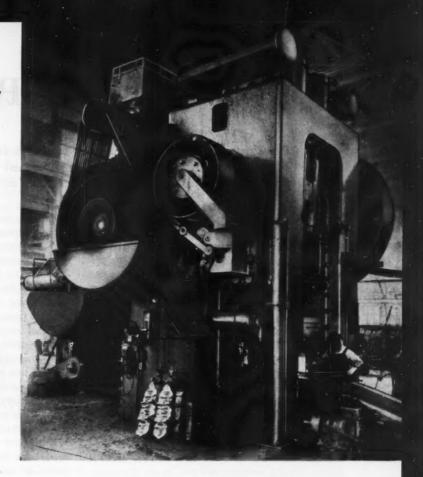
(Below) Acetate and glass cloth-backed "Scotch" brand pressuresensitive tapes are being used at the Buffalo, N. Y., plant of Farrar & Trefts, Inc., to hold the flux in place while welding seams on metal tanks. Applied to the under side of openings, the tape burns off when the metal is hot and bonded.



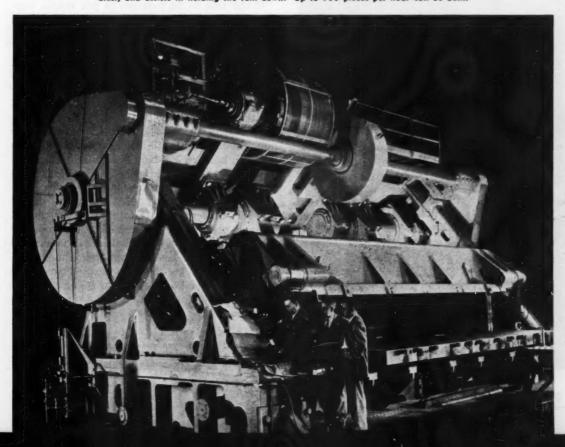


the Country

This 6000-ton press is used in a continuous forging operation for manufacturing automobile crankshafts at Chrysler Corporation's Dodge Forge Plant in Detroit, Mich. The high-speed mechanical forging press is capable of more than thirty-five strokes a minute, and is equipped with two dies. Heated billets are automatically unloaded from a furnace and conveyed to the press.



Massive "kickup" press employed at the A. O. Smith Corporation, Milwaukee, Wis., to bend steel sheets edgewise. Using a combination of mechanical, magnetic, and hydraulic power, the press can bend sheets as long as 19 feet, by 16 inches wide and 5/16 inch thick. Inside the foundation is much of the hydraulic mechanism which lifts the ram (shown propped up in this view for changing dies), and assists in holding the ram down. Up to 900 pieces per hour can be bent.



Production Punching on

Pressures Required for Punching on Press Brakes, Die Materials, Progressive Dies, and the Use of Widened Beds and Rams are Described in This Article, the Second of Two Installments

ARIOUS die arrangements and methods of clamping the work for punching operations on press brakes were discussed in the first installment of this article, which was published in the October number of MACHINERY. In this concluding installment, the pressure required for punching, die materials, progressive dies, and the use of widened beds and rams on press brakes are described.

The capacity of punching equipment on press brakes is almost unlimited. The piercing of 1-inch diameter holes in 1-inch thick mild steel plate is possible, and material as thin as 20 gage (0.036 inch) is regularly punched for cabinet work. Punching of aluminum or very thin metal where clearances are extremely close requires a careful set-up of the adjustable die units, and, for this reason, is not frequently done. Such

punching, however, has been employed in producing laminations. Guided punching units such as those made by Wales-Strippit are preferable for close clearance work. The maximum size hole that can be punched is limited by the strength built into the die and bolsters, which is affected by the size of the clearance hole necessary for slug disposal.

Pressures required to punch holes of various diameters in different thicknesses of mild steel plate having a shearing strength of 50,000 pounds per square inch are given in the accompanying table. The pressure required to punch other materials is directly proportional to their shearing strength. When the shearing strength of a material is unknown, it can be assumed to equal 80 per cent of the tensile strength. If the tensile strength is unknown too, it can be estimated by the following simple formula:

Tensile strength =
$$\frac{\text{Brinell hardness}}{2} \times 1000$$

If the hole to be punched is not round, onethird of its perimeter can be used as the diameter in determining the required tonnage from the table.

When all the punches in a multiple-punching set-up are the same distance from the diecalled "one-level" punching-the capacity of the press brake required is determined by multiplying the pressure shown in the table by the number of holes to be punched. For example, to punch four holes 11/16 inch in diameter and ten 1/2-inch holes in 1/4-inch thick mild steel plate. it can be seen from the table that 13.5 tons pressure is required to punch each of the larger holes (or a total of 54 tons), and 9.8 tons for each of the ten smaller holes (totaling 98 tons more). Thus, a pressure of at least 152 tons would be required to perform this job if all of the punches are on the same level. The total tonnage employed for punching should not exceed two-thirds of the rated bending capacity of the press brake to insure smooth operation and prevent undue stressing of the machine.

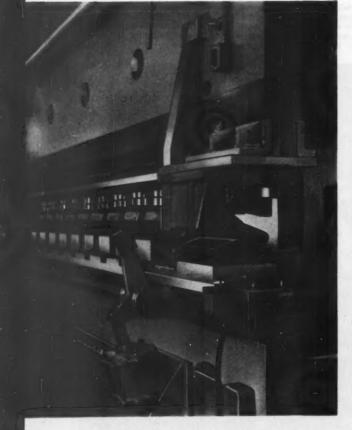


Fig. 12. Combination punching and cut-off die set up on a 1000-ton press brake for the production of 5/8-inch thick, high-carbon steel road scraper blades

Press Brakes

By W. EARL PETERS The Cincinnati Shaper Co. Cincinnati, Ohio

If the punches are "stepped" in relation to each other by a distance equal to one-half of the metal thickness or more, the total pressure required will be reduced to one-half for punches on two levels, one-third for punches on three levels, and one-fourth for punches on four levels. For instance, if the fourteen punches in the example described were arranged on three levels with stepping of at least 1/8 inch, the total pressure required would only be one-third of 152 tons, or 50 2/3 tons. Although three levels are most common in multiple punching operations on press brakes, as many as five levels have been used. The limiting factor, of course, is the increased length of unsupported punch. While the amount of stepping or vertical separation in punching mild steel should equal one-half the thickness, it is seldom made more than one-third the thickness when punching high-carbon steels. In punching high-carbon steel it is not necessary that the punch travel entirely through the work. The slug is "shot" out.

When performing extremely heavy punching operations on high-carbon steels, the impact effect on the press brake is much more severe than when the same pressure is exerted to punch mild steel. This is due to the smaller penetration of the punch required to shear high-carbon steel, and the extremely rapid release of energy immediately after shearing. Special features are needed on such press brakes, and they should be purchased with the manufacturer's full knowledge of their intended use. Such high-carbon parts include agricultural implement sections

made from re-rolled rails, spring leaves for automobiles and trucks, and blades for earth-handling equipment, such as scrapers and graders.

Although soft steels are sometimes used for light-duty punching tools because the material and fabricating costs are less, such dies are a poor investment when any sizable production must be attained, since they wear quickly. It is generally more economical to use a tool steel of the usual water- or oil-hardening grades. This is heat-treated to obtain the proper hardness and toughness to best suit the job.

Quite often air-hardening tool steels containing from 0.95 to 1.50 per cent carbon and from 5 to 12 per cent chromium are employed, with the less brittle steels having lower carbon and chromium content being used for heavier-duty punching on scaly materials. Such steels of 1.50 per cent carbon are used for punching stainless steel. Shock-resistant tool steels having a high silicon and manganese content are preferred for extra heavy punching, such as on steels containing from 0.45 to 1.00 per cent carbon. Die life is generally short, but the punches are not costly, being made without grinding.

For best results in punching mild steel on press brakes, the diameter of the die should be larger than the punch, the amount being equal to 10 to 14 per cent (5 to 7 per cent per side) of the metal thickness. More clearance is usual on hard or stainless steels, and less for brass and aluminum. Choice of clearance depends on the importance of taper and roughness in the hole.

Punching set-ups such as those shown in Fig. 1

Pressures Required to Punch Mild Steel Having a Shearing Strength of 50,000 Pounds Per Square Inch

Thickness	of Metal	Hole Diameter, Inch														
		1/8	3/16	1/4	5/16	3/8	7/16	1/2	9/16	5/8	11/16	3/4	13/16	7/8	15/16	1
Gage	Inch	Pressure, Tons														
20	0.036	0.35	0.53	0.71	0.88	1.1	1.2	1.4	1.6	1.8	1.9	2.1	2.3	2.5	2.7	2.5
18	0.048	0.47	0.71	0.94	1.20	1.4	1.7	1.9	2.1	2.4	2.6	2.8	3.1	3.3	3.5	3.
16	0.060	0.59	0.89	1.20	1.50	1.8	2.1	2.4	2.7	2.9	3.2	3.5	3.8	4.1	4.4	4.
14	0.075	0.74	1.10	1.50	1.90	2.2	2.6	2.9	3.3	3.7	4.1	4.4	4.8	5.2	5.5	5.
12	0.105	1.00	1.60	2.10	2.60	3.1	3.6	4.1	4.7	5.2	5.7	6.2	6.7	7.2	7.7	8.
11	0.120	1.20	1.80	2.40	3.00	3.5	4.1	4.7	5.3	5.9	6.5	7.1	7.7	8.3	8.8	9.
10	0.135		2.00	2.70	3.30	4.0	4.6	5.3	6.0	6.6	7.3	8.0	8.6	9.3	10.0	10.
3/16"	0.187		2.80	3.70	4.60	5.5	6.5	7.4	8.3	9.2	10.2	11.1	12.0	12.9	13.8	14.
1/4"	0.250	****		4.90	6.20	7.4	8.6	9.8	11.0	12.3	13.5	14.8	16.0	17.2	18.5	19.
3/8"	0.375		****			11.1	13.0	14.8	16.6	18.5	20.3	22.1	24.0	25.8	27.7	29.
1/2"	0.500						17.2	19.7	22.1	24.6	27.1	29.5	32.0	34.4	36.9	39.
5/8"	0.625									30.8	33.8	36.9	40.0	43.0	46.1	49.
3/4"	0.750											44.3	48.0	51.7	55.4	59.

(October MACHINERY, page 186) can be used as progressive dies. Such dies are often employed for making small items such as links, where a few holes are pierced and the part cut off in a series of operations that are adjustable as to position along the die.

Fig. 12 shows a set-up on a 1000-ton press brake in which a series of holes are punched in 5/8-inch thick, high-carbon steel road scraper blades. In the same die, the blade is cut off from bar stock which is fed from the right. The air cylinder, seen at the bottom center, serves to clamp the work against the gages. Stripping is done through a series of hydraulic cylinders which operate clamp type strippers through bell-cranks. Punch failure in this set-up is usually caused by fracture rather than wear, and guards must be provided to protect the operators.

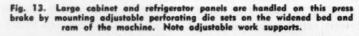
Hydraulic strippers serve not only for stripping, but also apply heavy pressures to hold the work solidly against the die during the entire punching and stripping cycle. This reduces punch breakage. The hydraulic cylinders for such purposes can also be mounted on the ram of the press brake, with the hydraulic fluid being pushed out of the cylinders by the press action and into an accumulator against gas pressure. A hydraulic pump is provided to replace any leakage losses. This is, in effect, a "spring" stripper with work clamping features.

Punching on Special Press Brakes with Widened Bed and Ram

Special wide-bed press brakes are well adapted to producing large panels for cabinets and refrigerator shells, laminations for large electrical transformers and motors, and many other sheetmetal parts. Adjustable die sets mounted on removable angle brackets bolted to the press brake bed and ram are frequently employed to perforate such large sheets. Solid welded beds and rams may be used instead of angles. The operation shown in Fig. 13 has been set up with adjustable perforating die sets made by S. B. Whistler & Sons.

The amount that the bed and ram of the press brake can be widened depends on the general construction and size of the machine. If the work allows, bed and ram can be widened by welded members. Large press brakes are seldom widened beyond 42 inches, and smaller machines less. Fig. 14 shows a set-up for punching corn crib sheets on a 90-ton press brake. This is a comparatively light-duty operation and, for this reason, the bed and ram could be made extremely wide for the size machine. Lamination sheets as large as 36 by 96 inches are being pierced in press brakes by one of the largest electrical manufacturers in Europe, using fixed center dies.

The load applied to press brakes having wid-



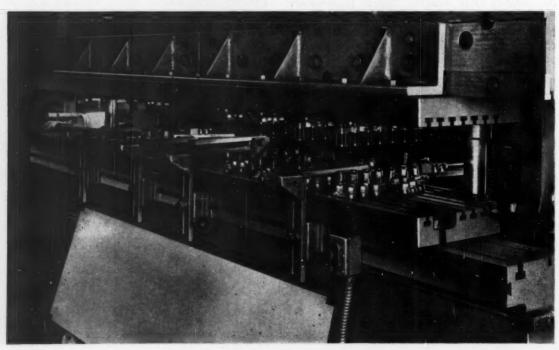


Fig. 14. For light-duty punching operations such as are required in the production of corn crib sheets, extensions on the press brake ram and bed can be made quite wide.

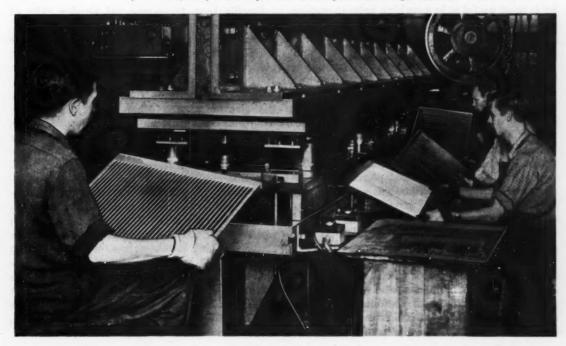


ened rams and beds should be centralized with respect to their rams. This does not mean that the overhang of bed and ram need be symmetrical, since the front or rear extension may have to be wider to balance the load.

Many manufacturers of such articles as refrigerator shells, switch boxes, television chassis, and similar work of about the same size are using press brakes. The work is generally passed from hand to hand, Fig. 15, first blanking and punching, then forming, side punching, etc., to complete a part in the one machine. An unusual point about this method is that it is being employed for both small and high production.

Fig. 16 illustrates a press brake set-up for notching, drawing, trimming, and restriking the top of a refrigerator inner liner on a small production basis. Since only about 1000 refrigerators are produced per year in this small foreign plant, every stamping required is produced in set-ups of this kind on the one machine. The front extension on the bed is made removable,

Fig. 15. By mounting blanking, punching, and forming dies side by side on the press brake, many different parts can be completed on a single machine.



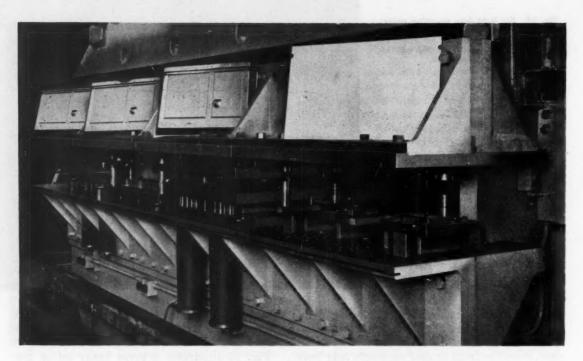


Fig. 16. Press brake set-up for drawing and punching the top of refrigerator inner liner. Parts produced in each die are shown on the front ram extension.

so that the press brake can be used for trimming and punching edges, and forming return flanges, etc., on drawn stampings.

Frequently, small notching operations can be performed on large parts by placing the notching die at one end of the forming die. This avoids extra handling. One instance where such a setup is most useful is in punching holes in various parts which must be hung on painting conveyors. A manufacturer of corn crib roofing panels forms the panels and pierces holes by providing hydraulic piercing units in the forming die. The necessary hydraulic pressure is supplied by a piston in a cylinder on the press brake.

Many other combinations are used where punching and forming operations are performed with only one handling of the work-piece. For example, one manufacturer of sectional culvert plates forms a rib in one stroke of the machine, then gags in the punches and pierces the holes on the second stroke, without moving the part. This set-up is ideal for a moderately small production. Other manufacturers of the identical product use very elaborate, automatic feeding devices to obtain higher production.

A press brake, whether already in the manufacturer's plant or an item for future purchase, is more than a bending machine. Its ability to punch greatly extends its usefulness. Bending applications can be expanded almost indefinitely. Likewise, punching and the combinations de-

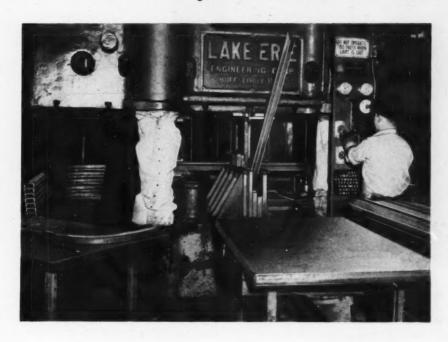
scribed in this article can be extended to the limits of machine capacity, the designers ingenuity, and necessity.

Ductile Iron Production Skyrocketing

Ductile Iron, three-year old wonder child of the International Nickel Co.'s Bayonne, N. J., Research Laboratory, continues to gather new laurels in the gray iron foundry. Up from 3500 melt tons in 1949 to an estimated 80,000 to 100,000 melt tons in 1952, this high-carbon, spheroidal-graphite ferrous material combines the mechanical and other properties of gray iron, malleable iron, and steel. Because of its fluidity and because it can be produced in the cupola, Ductile Iron has wide flexibility with respect to the size, intricacy, and number of castings that can be produced at any given time.

At present, approximately two hundred companies in this country, Canada, and abroad, operating five to six hundred foundries are licensed to produce Ductile Iron. Castings range from those weighing a few ounces, with sections as light as 0.100 inch thick, to 50-ton anvil blocks having sections 48 inches thick. Among the hundreds of Ductile Iron items now being cast are gears, car wheels, cylinder heads, brake drums, crankshafts, connecting rods, plowshares, axles, engine housings, pipe, and flywheels.

Cold-Forming of Channels on a Vertical Hydraulic Press



An Improvised Set-Up on an Existing Hydraulic Press Permits the Cold-Bending of a 3-Inch by 4.1-Pound Structural Channel to 8-Inch Radii

By RALPH WAGNER
Industrial Engineering Supervisor
Crosley Division, Avco Mfg. Corporation
Nashville, Tenn.

RACED with the problem of forming structural channels and not having conventional bending equipment, such as bull-dozers, engineers at the Nashville plant of Crosley conceived the idea of forming the bends on an existing vertical hydraulic press. The formed channels are required as arch frames for side delivery rakes manufactured for Harry Ferguson, Inc.

Structural channels used for the rake frames are 3 inches wide and weigh 4.1 pounds per foot of length. It is necessary to bend the channel into a U-shape with the two rounded corners formed to inside radii of 8 inches. This operation is now performed cold on the Lake Erie 750-ton, vertical hydraulic press shown in the heading illustration. Fourteen holes ranging

from 15/32 to 57/64 inch in diameter are also punched through each rake frame in the same set-up.

After cutting the structural channel to the required length, a flexible mandrel or "snake" is placed in the channel, Fig. 1, to prevent the legs or flanges from collapsing during the forming operation. The snake consists of a series of cast-iron blocks strung on a wire cable and spring-loaded from both ends.

Although such structural shapes are usually heated to facilitate bending and minimize spring-back, it was found that the channel could be formed cold by means of an improvised set-up. A drawing of the die is shown in Fig. 2. The channel, with the snake in position, is placed in the die, resting on two hardened and ground tool-



Fig. 1. A flexible mandrel, consisting of a series of cast-iron blocks strung together, prevents the channel legs from collapsing during the forming operation.

steel rollers A and located by abutting one end against a positive stop, not shown. These rollers are freely mounted on studs B, which are screwed into vertical plate C of die-holder D, and rest in semicircular bearing surfaces on the top of the cast Meehanite form die E. Considerable clearance is provided between the bores of the rollers and the outside diameters of the studs to prevent binding and permit rotation of the rollers as the structural channel is bent downward.

Both plate C and side-plate F are provided with Meehanite wear plates G. When the faces

of plates G become worn due to sliding friction of the channel during forming, they can be reground and shims placed between plates G and back-up plates C and F. This represents a considerable saving in maintenance costs, since replacement of the wear plates is not necessary. Side-plate F and the wear plate attached thereto can be pivoted slightly to facilitate unloading and reloading of the channel by means of a half-round bar H welded to the lower edge of plate F and a mating socket J secured to the base of die-holder D by screws and a wedge block.

Fig. 2. Die designed for bending 3-inch channel in an improvised set-up on the 750-ton vertical hydraulic press seen in the heading illustration.

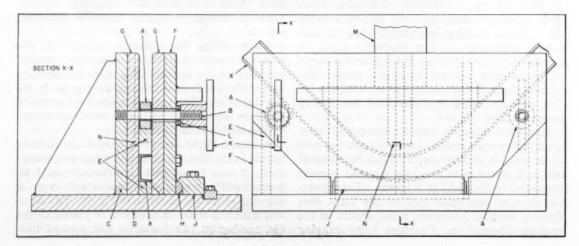


Fig. 3. Channel to be employed for the arch frame of a power rake has been bent to the desired 8-inch radius as the press ram reaches bottom of stroke.



With the channel to be bent resting on rollers A, handle K is tightened to grip the work between wear plates G. Rocker type thrust washers L are provided between the hub of handle K and side-plate F. Punch M, attached to the ram of the hydraulic press, is equipped with a key N that slides in a vertical slot in the left-hand wear plate G.

During forming, the channel is confined between the wear plates and the formed portions of the punch and die. The rollers reduce the amount of friction as the channel is forced downward into the die, and the snake prevents the legs of the channel from collapsing inward. Work-piece X is shown in position at the bottom of the downward travel of the press ram. A view of this particular point in the operating cycle is seen in Fig. 3.

When the ram rises, Fig. 4, the clamping handle is loosened, the bent channel is pulled from the die, and the flexible mandrel is removed from the work. Ordinarily, a complete production lot of rake frames is first bent at one end, and then the parts are reprocessed through the press to bend the opposite ends. This procedure facilitates production, since it is not necessary



Fig. 4. When press ram rises, the formed channel is pulled from the die and the flexible mandrel removed from the work.



Fig. 5. Fourteen holes, from 15/32 to 57/64 inch in diameter, are pierced in the rake frame in a multiple punching appropriate at rear of the areas.

to reverse the position of each channel between bends. Also, since it is required that each bend be a different distance from opposite ends of the channel, it would be necessary to change the position of the locating stop each time. Lubricating compound need only be applied to the punch and die after bending about five channels.

Simultaneously or subsequently—depending upon whether production requirements warrant the use of an additional operator—holes are pierced in the rake arch frames by means of a multiple punching set-up at the rear of the press,

Fig. 5. A total of fourteen holes—two 15/32 inch, eleven 21/32 inch, and one 57/64 inch in diameter—are all punched at one time. A close-up view from one side of the press, Fig. 6, shows the punches employed to pierce nine 21/32-inch diameter holes through one end of the channel. It can be seen that the punches are stepped in relation to each other to reduce the total pressure required for the operation. The amount of stepping or vertical separation between the faces of adjacent punches is made equal to one-half the thickness of the channel.

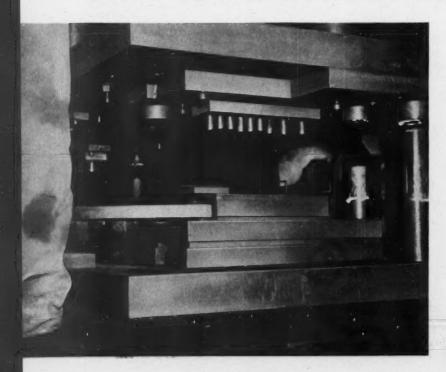


Fig. 6. Close-up view showing nine of the fourteen punches used in the set-up seen in Fig. 5. The punches are stopped to reduce the required pressure.

INGENIOUS

Mechanisms Mechanisms Selected by Experienced Machine Designers as Typical Examples Applicable in the Construction of Automatic Machines and Other Devices

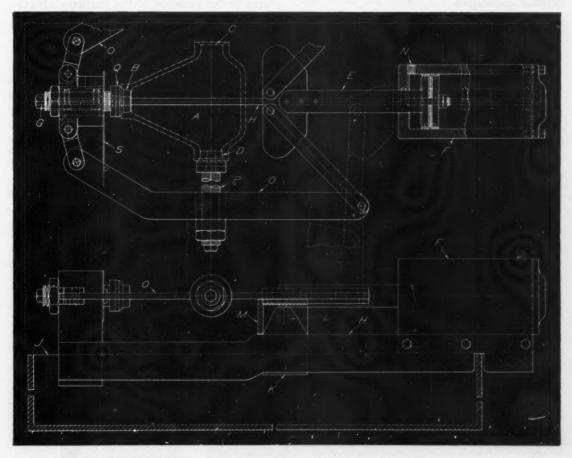
Clamping Arrangement for Sealing Castings to be Tested for Leakage

By ROBERT S. NEWTON

The testing fixture shown in the accompanying illustration was designed for use in detecting leakage in castings having a relatively large cored chamber A with three pipe outlets or openings at B, C, and D. The problem of providing means for sealing the three outlets quickly and effectively to permit testing the castings for leakage was solved by the special linkage mechanism

illustrated. The fixture is intended to compensate for variations in the castings and to permit quick loading and unloading.

The piston E of air cylinder F operates the linkage mechanism which seals the openings B, C, and D of the casting by applying pressure to rubber sealing and locating plugs Q at each of the openings. After the openings are sealed, compressed air is admitted to chamber A of the casting through an air-line connection at G. The fixture assembly, consisting of the operating mechanism, air cylinder, and supporting bar H, is balanced on the edge of a water tank J by an



Fixture with air-operated clamping mechanism designed to seal three openings from large cored chamber of casting, making possible rapid checking to detect leakage

adjusting bracket K on bar H. When properly adjusted, the assembly will balance on the pivoting pin L in bracket M attached to the edge of the tank.

In operation, the casting to be tested is centered in the fixture on locating member Q which fits into opening B. The adjusting screw at G is then set as air is slowly admitted to air cylinder F until locking levers O are in the clamping position shown in the upper view of the illustration. Screws G and P are adjusted, if necessary, to obtain positive sealing of the openings. Air at a suitable pressure is then admitted through screw G and the casting lowered into the water until completely submerged by raising cylinder F. The slightest leakage can then be detected and its position marked on the casting. The castings can be tested in this manner in thirty seconds.

The steel spring S is provided simply to hold the levers in position for setting up the fixture and to hold locking levers O in position for clamping. Pilot nuts on screws G and P can be provided to suit different castings in a wide range of sizes and shapes.

Air-Powered Electrically Controlled Rotary Index Work-Feed Table

The use of an air motor for indexing is a feature of a work-table recently added to the line of "Controlled-Air-Power" devices manufactured by the Bellows Co., Akron, Ohio. The index

table, which is shown in Fig. 1, is rotated and positioned by a special 3 5/8-inch bore Bellows air motor equipped with a built-in "Electroaire" directional valve and speed controls shown in Fig. 2. The air motor develops a stroke pressure ten times that of the air line. A gear rack attached to the air motor piston-rod drives a quadrant gear which rotates the table top a predetermined number of degrees in a clockwise direction. The valve which actuates the air motor is operated by 8-volt solenoid control units designed to eliminate the possibility of burn-outs.

Around the perimeter of the table top are equally spaced indexing holes which are engaged by an air-operated locking pin. The detailed operation of the rotary index table can be followed on the accompanying wiring diagram, Fig. 3. When an electrical circuit is completed through external connections to Terminals 5 and 6 in terminal box (19), it energizes the retracting solenoid of the Electroaire valve (1) used to control the auxiliary air cylinder which operates the shot-pin. The shot-pin retracts, releasing the index table top. As the shot-pin retracts, a drop in the pressure of the auxiliary air-cylinder exhaust line allows the pressure switch to assume the position shown in the diagram. Current flows through the pressure switch and energizes the advance solenoid of the built-in valve (2) on the air motor. This causes the piston-rod to advance and index the table through the rack, quadrant gear, and air-locked pawl.

As the table is indexed into position, it trips the shot-pin advance switch, energizing the advance solenoid of the Electroaire valve (1) and

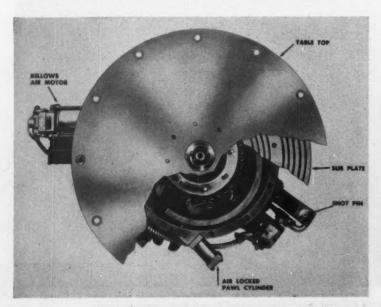
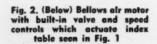
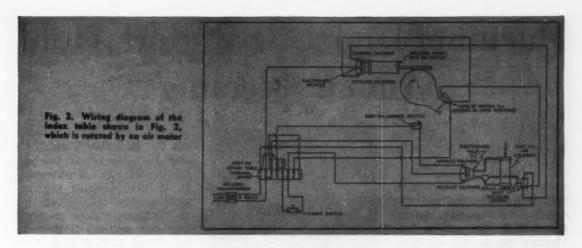


Fig. 1. Bellows rotary index work-feed table







causing the shot-pin auxiliary air cylinder to advance and drive the shot-pin into one of the twelve tapered indexing holes in the table top, locking the table in position. High-pressure air, tapped from the advance side of the shot-pin air cylinder, reverses the pressure switch, sending current through the N.C. impulse switch to both the retract solenoid of Electroaire valve (2) and to Terminal 7 in terminal box (19)—to provide an impulse current source to operate the auxiliary equipment.

The piston-rod of the air motor then retracts, and the pawl overrides the table top gear, the table still being held in its shot-pin-locked position. When the air-motor piston-rod reaches its fully retracted position, an adjustable trip opens the N.C. impulse switch, and the index table is ready to repeat another cycle to be initiated by contact, manual, or automatic control through Terminals 5 and 6. All internal wiring of the rotary index table is connected to a convenient terminal box, mounted on the outside of the table.

Work-Tilting Device Permits Radius Grinding with Flat Cup-Wheel

By LEIF WEYWADT

The mechanism shown in Fig. 1 was designed for grinding a radius r on the heel edge of flatirons, using the entire flat surface of a cupwheel. As a result, no wheel dressing was required and the working surface of the cup-wheel wore uniformly. The work is clamped in a tilting fixture whose principles are shown in the enlarged cross-section, Fig. 2.

It can be seen that turning the hand-lever downward rotates crank R about point A in the direction of the arrow. Point P, the center of the desired radius, travels downward in a straight path due to the confinement of roller B in a groove in the frame of the fixture. At the same time, the fixture tilts about the axis of the roller producing the radius on the heel edge at the back end of the flatiron.

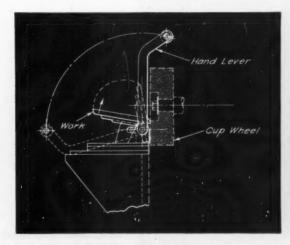


Fig. 1. Grinding fixture for producing a radius on the heel of flatirons

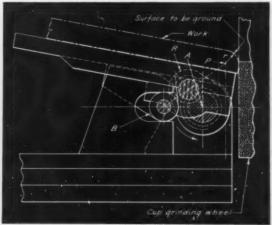


Fig. 2. Enlarged view of rotating and tilting members of fixture shown in Fig. 1

Machine Tool Distributors Hold Annual Meeting

OVERNMENT regulations as they pertain to the selling practices of the American Machine Tool Distributors' Association held the spotlight at the twentyeighth annual meeting of that Association, which convened at Virginia Beach, Va., on September 29 and 30. At the opening session, Edgar J. Seifreat, president of the Association, emphasized the necessity of providing highly qualified men for filling temporary positions in certain government bureaus in Washington that control business matters of importance to the Association.

Matters of vital interest were covered in reports made by the Government Relations Com-

mittee and the Sub-Committees on Federal Taxes and Permanent Defense Capacity.

Addresses were made by Ralph S. Howe, director, Metal-Working Equipment Division, National Production Authority, Washington, D. C.; Swan E. Bergstrom, vice-president of the National Machine Tool Builders' Association and vice-president of the Cincinnati Milling Machine Co., Cincinnati, Ohio; Thomas R. Rudel, chairman of the Sub-Committee on Renegotiation and



John M. Riordan, who was recently elected president of the American Machine Tool Distributors' Association

president of the Rudel Machinery Co., Inc., New York City; and Joel Barlow of Covington & Burling, Washington, D. C. An inspiring talk on salesmanship was given by H. B. Sharer, sales training specialist with the U. S. Rubber Co., New York City.

The following officers were elected for the coming year: President, John M. Riordan, Riordan Machinery Co., Detroit, Mich.; vice-president, E. R. Motch, Jr., Motch & Merryweather Machinery Co., Cleveland, Ohio; second vice-president, Thomas R. Rudel, Rudel Machinery Co., Inc.; and secretary and treasurer, George B. McClennen, Delta Equipment Co., Philadelphia, Pa.

Members of the executive committee who were elected for the terms expiring in 1955 are: C. Kyrle Raber, State Machinery Co., Indianapolis, Ind.; R. A. Vidinghoff, Machinery Associates, Inc., Philadelphia, Pa.; and Spencer B. Booz, Federal Machinery Sales Co., Chicago, Ill. The member selected for the term expiring in 1953 to fill the unexpired term of Thomas R. Rudel is C. J. Harter of the firm of C. J. Harter, Machinery, Houston, Tex.

Safety Rules for Operation of Conveyors

Ten safety rules to be followed in the operation of conveyors were recently proposed by Jervis C. Webb, executive vice-president and general manager of the Jervis B. Webb Co., Detroit, Mich. These rules are as follows:

- 1. Never put a conveyor system into operation until it has formally been turned over by the manufacturer.
 - 2. Be sure the driving machinery is guarded.
- Provide adequate clearances for maximum loads.

3. Keep lubricant piped to safe points.

Consider visibility in locating controls and in loading.

- 6. Confine operation of conveyors to authorized employes.
 - 7. Leave repair to maintenance employes.
- 8. Provide a smooth cover under slat conveyors to avoid shearing.
- 9. Insist on no riding and no stepping on work conveyors.
- 10. Instruct employes in loading—to consider clearances, visibility, protruding hazards, and danger of tumbling.

Annual world cost of replacing and repairing corroded materials and equipment is estimated at \$6,000,000,000 by Electrochemical Society.

TOOL ENGINEERING

Tools and Fixtures of Unusual Design and Time- and Labor-Saving Methods that Have been Found Useful by Men Engaged in Tool Design and Shop Work

Useful Shop Gage for Accurate Checking of Tapers

By W. M. HALLIDAY, Birkdale, Southport, England

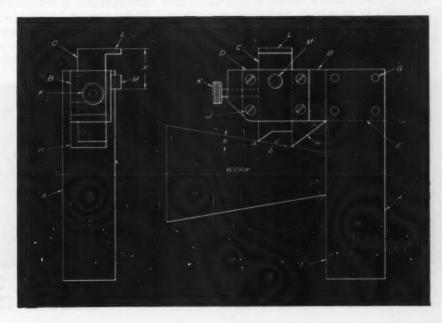
The illustrated gage, together with an ordinary outside micrometer, is all that is needed to quickly and accurately determine the taper per inch of a frustum of a cone, such as a tapered plug gage. The only requirement is that at least one of the bases of the component being measured be square with its center line.

The principal parts of the gage are a beam A, an arm B, a movable finger C, and a keeper-plate D. All these parts are made of steel. The beam can be of any suitable length. It is a thicker member than the arm, which it accommodates in a milled slot E. This slot is made exactly 90 degrees with the register edge F of the beam. Four rivets G retain the arm permanently in the slot.

On the under side of the arm and immediately adjacent to the register edge of the beam is an integral extension H exactly 1.000 inch wide.

Its lower end is ground back to create a sharp edge with its left side, and immediately adjacent is the movable finger C, also exactly 1.000 inch wide. This finger is free to slide up or down in a guideway in the arm against the friction of the keeper-plate, held in place by four screws J. By tightening a thumb-screw K in the end of the arm, the setting of the finger can be fixed. Like the integral extension, the finger is ground back at its lower end at an angle to create a sharp edge with its left side. At its top, the finger has a lip L projecting over the keeper-plate.

A short cylindrical dowel pin M is pressed into the face of the keeper-plate, with the distance X from the bottom of the pin to the top of the lip measuring exactly 1.000 inch when the lower edge of the finger is in the same horizontal plane as the lower edge of the extension. (In constructing the gage, this distance can be established by first leaving the lip thicker than is required, then aligning the two edges with a try-square and grinding off the top of the lip until the distance X is exactly 1.000 inch. Or, the diameter of the pin can be left over size, then removed and



Simple gage for use with a micrometer to measure the taper per inch of a surface

ground down the necessary amount.)

In order to determine the taper per inch, the finger is raised and the work held in the position illustrated—the extension in contact with the tapered surface, and one base of the work bearing against the register edge of the beam. As has been stated, this base must be known to be square with the center line of the work. The finger is next lowered into contact with the tapered surface. and fixed by tightening the thumb-screw. The work can then be removed.

Distance X is read with a 2inch micrometer. By subtracting 1 inch from the reading, the height of the side a of the right triangle abc is derived. This distance is also the taper per inch of the surface.

It is then a simple matter to establish the angle θ which the tapered surface forms with the center line of the work. For

example, if the micrometer reading for distance X is 1.176 inches, then a=0.176 inch, and

$$\operatorname{Tan}\theta = \frac{a}{b} = \frac{0.176}{1}$$

By referring to a table of natural trigonometric functions, it is found that $\theta = 10$ degrees. The included angle of the component under consideration is 20 degrees, and the included taper per foot is $0.176 \times 2 \times 12$, or 4.224 inches.

If the component had been gaged in a reverse manner, with its larger base adjacent to the

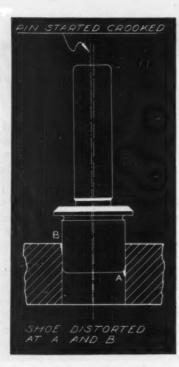


Fig. 1. A misaligned leader pin assembled in a die-shoe causes the distortion shown.

register edge, then the distance X would be measured with a 1-inch micrometer, and the height of the side a would be obtained by subtracting the micrometer reading from 1.000 inch.

Assembling Leader Pins and Bushings in Die Sets

By JOSE SOBKOWIAK Jackson, Mich.

The following describes a method of firmly and accurately anchoring leader pins and bushings in die sets. This design has several interesting features not generally found in conventional methods. Usually, when a leader pin or bushing is pressed into an under-size bored hole in a die-shoe or punch-holder, there is the possibility of misalignment. This causes the bore to become distorted, as seen in Fig. 1, result-

ing in a misfit between the pins and bushings, tightness at the top or bottom, or sometimes both.

Most dies and punches are reground when they become dull, and in some cases either the parts to be ground or the leader pins and bushings must be removed to permit grinding clearance. Either way, this is time-consuming and mistakes in reassembly are always possible. If the pins and bushings are pressed out, they are almost sure to change in alignment when pressed back into place again, and, if correct alignment is maintained during reassembly, the

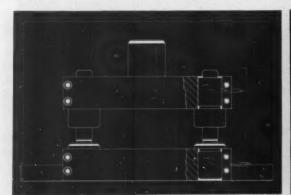


Fig. 2. Leader pins and guide bushings are assembled in this die set by slotting the die-shoe and punchholder, and clamping with screws.

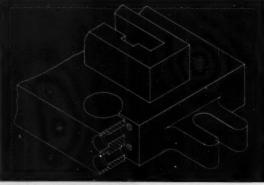


Fig. 3. Diagram of die-shoe having a clearance slot between the leader-pin hole and the pin. Clamping is achieved by socket head cap-screws.

pressed fit will not be as tight as before they were removed.

Anchoring the pins, as illustrated in Figs. 2 and 3, eliminates all of the above-mentioned hazards, contributes to the over-all accuracy of the die, and cuts maintenance time. A press is not used or needed with this method, since the pins and bushings fit by hand and are tightened in place with a socket head wrench. Positive alignment and squareness with the shoe surface are assured. The pins or bushings can easily be removed to permit grinding and replaced in the exact, original location. Regardless of the number of times they are removed, there is no distortion of the holes in the shoes.

These holes are bored to the required size, and the outside diameters of the pins and the bushings are ground to the same size. A saw cut is made in the die-shoe after the bore is made. The holes will open slightly when the cut is made. This small clearance will permit a hand fit between the pins and the shoes, and the screws operate as a clamp to keep the pins and bushings in place.

Two-Way Drill Jig Lessens Handling Time

By MIRZA USMAN BEG, Karachi, Pakistan

By using alternate ends of the illustrated drill jig, the operator is able in a single motion to unload one work-piece, load the next work-piece, and position the jig beneath the drilling machine spindle. The jig A is designed symmetrically so that in either end it can accommodate the pinfork B through which holes C are to be drilled.

When using the left-hand end, the jig is banked against the stop S_1 , as shown, with the bushing D_1 centered beneath the drill. After this piece is drilled, the operator loads the next piece in

the right-hand end of the jig. As he executes this motion, the first piece is automatically ejected, and the jig is shuttled against stop S_2 , with the bushing D_2 beneath the drill.

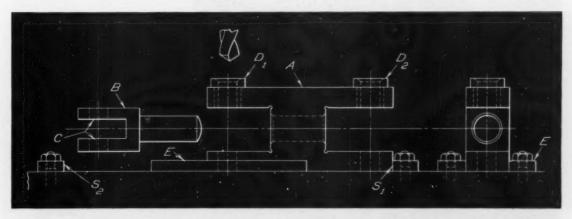
This procedure is repeated for all subsequent pieces in the lot. To confine the shuttle of the jig to a straight line, as well as to hold the jig against the torque of the drill, guides *E* are fastened to the machine table.

Tapered Extrusions Effect Design and Production Economies

Taper extruding provides the answer to the design engineer's demand for a shape with a uniformly decreasing area. By using a tapered mandrel, it is now possible to extrude a square tube with tapered walls. When the unwanted side walls of such a tube are cut away, two tapered members are produced.

By moving the tapered mandrel through the die opening, wide changes in width, thickness, and shape can be obtained throughout the extrusion's length. When parts are preformed by taper extruding before forging, the number of forging operations required will be reduced, and blocking operations may be eliminated entirely.

In 1951, over 85 per cent of the total value of machine tools shipped was accounted for by companies located in the New England and East North Central States. Ohio ranked first with \$192,000,000, 30 per cent of the United States total, and the five East North Central States—Ohio, Indiana, Illinois, Michigan, and Wisconsin—accounted for 58 per cent of the United States total. Machine tools were produced in twenty-seven States during 1951.



With one motion, the operator can unload, reload, and position this simple drill jig.

Fig. 1. Left-hand tool-head on cross-rail of doublehousing planer employed for cross-planing of horizontal or vertical surfaces

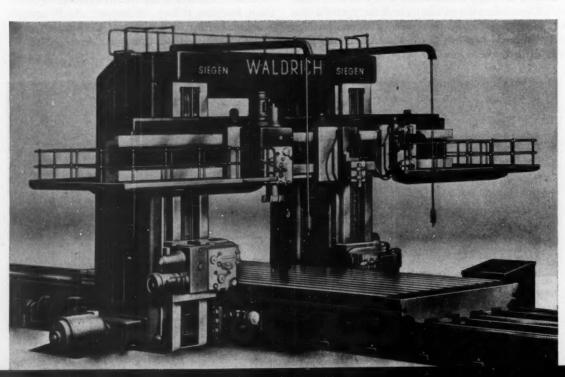
Fig. 2. Table of this large planing machine is fitted with two helical racks and driven by two main motors, one on each side of column.

Unusual Machines the Hanover

HE second European Machine Tool Exhibition, organized by the European Committee for the Cooperation of Machine Tool Industries, was recently held at Hanover, Germany. More than 800 exhibitors from Germany, France, Belgium, Switzerland, Italy, Holland, and Sweden displayed their products. A noteworthy feature of the exhibition was the number of very large machine tools shown.

An unusual arrangement on a large double-housing planer displayed by Wagner & Co. permits the cross-planing of either horizontal or vertical surfaces. This is accomplished with the left-hand tool-head on the cross-rail, Fig. 1, for which a steplessly variable, reciprocating drive is provided. Means are provided for locking the table when vertical faces are being machined, while for horizontal faces an intermittent table feed motion is brought into use, which is also steplessly variable.

A large planing machine demonstrated by H. A. Waldrich, G.m.b.H., is shown in Fig. 2. The table of this large machine is fitted with two helical racks and driven by two main motors, one at each side of the column. An interesting feature of this machine design is that feed-screws have been eliminated from the cross-rail. The carriage of each planing tool has a self-contained motor drive, and the feed and rapid traverse movements are obtained through a worm meshing



Displayed at Exhibition

with a worm rack extending for the length of the cross-rail. With variable-speed drives for the feeds, cross-planing can readily be performed. A patented tool retracting mechanism lifts the tools vertically (in the case of the crossrail carriages) through a relatively long, adjustable distance, so that deep grooves can be satisfactorily machined.

A single-column, vertical turning and boring mill with movable table was shown by Société Anonyme Des Anciens Etablissements Charles Berthiez. This machine, Fig. 3, has a table 12 feet 4 inches in diameter, but since the entire table unit is movable along the ways, work up to 23 feet in diameter can be machined. A fixed-table, single-column vertical turning and boring mill displayed by the same company was equipped with an electronic, two-dimensional copying attachment.

Among the heavy-duty lathes displayed was one of massive construction manufactured by Alfred Wirth & Co. for rough-turning ingots. This lathe, shown in Fig. 4, will handle alloysteel ingots up to 20 inches in diameter by 50 inches long. The work is held in a specially designed hydraulic chuck, and supported by a hydraulically operated tailstock center. The tool carriage moves on the vertical face of an overhead bridge member, with longitudinal and transverse motions being obtained hydraulically. An adjustable former bar carried on the bridge behind the carriage is used for taper-turning.

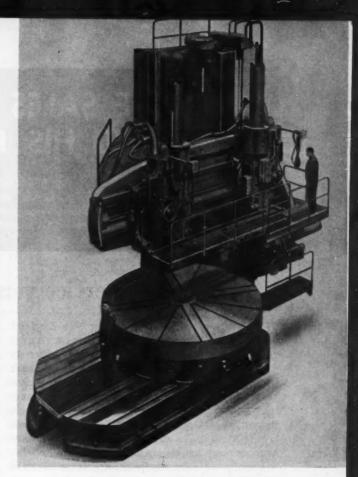
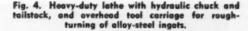
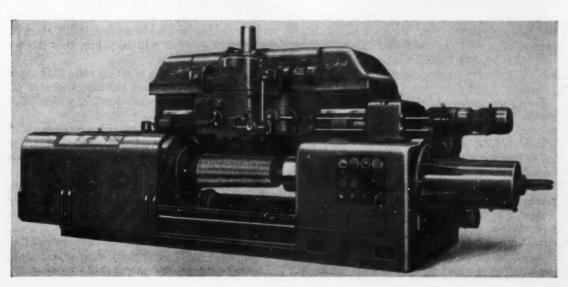


Fig. 3. Movable table on this single-column, vertical turning and boring mill allows work up to 23 feet in diameter to be machined.





THE SALES ENGINEER AND HIS PROBLEMS

By BERNARD LESTER Lester and Silver Sales Management Engineers New York and Philadelphia



Selling Service versus Giving Service

THE vice-president of a leading New England machine tool manufacturing concern says: "Service is a subject which has always given us difficulty and will be more serious in the months to come." Amplifying this remark, he states that the chief difficulty is not lack of headquarters assistance available to the sales engineer, but rather lack of complete and reliable information from the sales engineer in those cases where headquarters assistance is requested.

Usually we sales engineers are more effective in selling potential service than in giving it. Having recently waited one month for standard replacements of burners for an electric range, as a purchaser I wonder whether the manufacturer would not sell more ranges if some of the money spent for sales and promotional effort were spent in giving better service to the buyer. Let us examine the common causes of customer dissatisfaction with equipment he has bought.

- 1. Defects in the construction of the machine or tool itself, or physical failures.
- 2. Inability of the machine or tool to give satisfactory production, meet required tolerances, or provide the necessary finish.
- 3. Misapplication of the machine or tool and lack of maintenance and care.
 - 4. The buyer's prejudices or dislikes.

Note how each point progressively deals with personal relations between the salesman and the purchaser. Selling the tool is only the first step. The second step of customer satisfaction in service is equally important. Satisfaction is partly based on facts and partly an attitude of mind. Hence selling is satisfying—satisfying one or more persons.

Any complaint made and not met grows in geometric proportions. Some inadequacy in tool operation, even though minor, can lead the feverish mind to conclude that the tool is "no good." The more we go influencing the prospect

to buy, the more fully we must meet his expectations, if we expect to continue in business. The farmer never gets a crop by just planting the seed. Care, cultivation, and harvesting are necessary.

What, too often, is the thinking of an inexperienced sales engineer?

"I have sold the tool. It has no defects. If it doesn't perform I'll report this failure to the factory. They will fix it up. I don't want to take time out from getting more orders."

Any salesman who takes this attitude misses the true concept of selling.

He doesn't grasp the fact that giving service to the point of complete buyer satisfaction is in itself a large factor in selling.

He misses the point that everything may be right about the tool itself, but everything may be wrong in an irate purchaser's mind.

He doesn't realize that when the tool is producing "more and better" than expected, he, his company, and the tool are all "tops."

He forgets that in helping a customer get the most from his tool, he is adding to his store of information—which will help him to sell elsewhere.

It may be dangerous to set up rules that apply to servicing, but here are principles, simple indeed, applying to efficient service, which can't be repeated too often.

- 1. Be present when a machine you have sold is being installed, or, if unpractical, carefully outline all points to look out for in installation and operation.
 - 2. Check results by telephone, letter, or visit.
- 3. Act on complaints promptly, no matter what sort, screening them also by telephone, letter, or visit.
- 4. Take time to observe all matters relating to operation of the equipment, such as materials, cutting tools, and operators' skill.

5. When calling for expert headquarters help, state conditions and nature of trouble in detail.

6. Sell and resell the advantages of the tool to the purchaser, until his mental attitude toward it is favorable.

7. Use experience gained in servicing to help in future selling.

The big point too many of us miss is that no sale is really made until the buyer gets results to his satisfaction from the use of the equipment he bought.

Save Dollars by Keeping Compressed Air Lines Tight

It has been found that if the pressure of compressed air reaching a pneumatic tool falls from 90 to 70 pounds per square inch, production output of that tool may drop as much as 35 per cent. Also, air motors, built to operate at 90 pounds per square inch, will lose 25 per cent of their capacity if line losses in delivering the air cause the pressure to drop to 70 pounds per square inch. The air pressure received by the tool can be checked quickly by means of a hypodermic needle gaging device, as shown in the accompanying illustration. The hole made by the needle of the gage is self-closing.

The tendency when air pressures drop is to place the blame on insufficient compressor capacity. A check of the air distribution system, however, may show that the compressor is satisfactory. Leaks in the distribution system are one of the principal causes of low-air pressure.

Results have proved that the most likely locations of small leaks are around valve stems, hose connections, unions, drains, home-made blowguns, and lines leading to inoperative tools.

Cost of Air Line Leaks from Various Size Openings

Size of Opening, Inch	Air Lost in Cubic Feet Per Month at 100 Pounds Per Square Inch (Based on a Nozzle Coefficient of 0.65)	Cost of Air Lost (Based on a Cost of \$0.07 per 1000 Cubic Feet)
3/8	6,671,890	\$467.03
1/4	2,920,840	204.46
1/8	740,210	51.81
1/16	182,272	12.75
1/32	45,508	3.19

Plant maintenance departments have come up with simple and ingenious ways to check leaks. Most frequently used are the lighted candle and the solution of soapy water which is brushed around suspected areas. One manufacturer puts essence of peppermint into the air system, and detection of the slightest leak is by odor. Still another method is the use of a small siren-like whistle. When it is passed over the lines, a siren noise indicates a leak.

Some leaks although small, may be numerous, and have a high accumulative effect. Actually, such leaks can result in a substantial loss, as shown in the accompanying table. When savings in compressed air are added to the increased productive output of the pneumatic tools, it is obvious that it pays to keep the air lines tight.



Pressure of the compressed air received by pneumatic tools can be easily checked with a hypodermic needle againg device. The hote made by the needle is self-closing.

LATEST DEVELOPMENTS IN

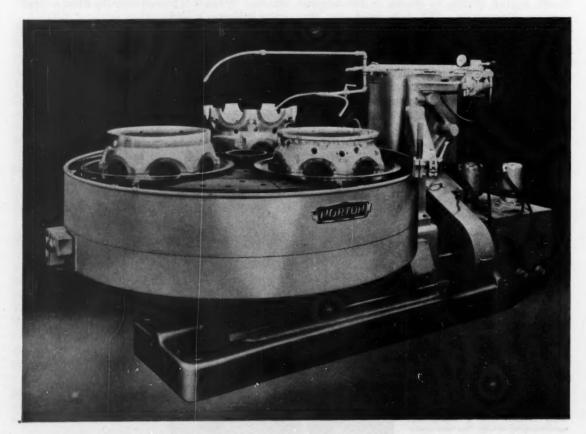


Norton Flat Lapping Machine for Large-Size Parts

The Norton Co., Worcester 6, Mass., has brought out a flat surface finishing machine equipped with a segmental type bonded abrasive lap 60 inches in diameter. This equipment has been developed to produce a clean, finished surface on soft metal parts. Surfaces finished by the large segmental lap are said to be free from grit embedded or trapped in pores or crevices. The machine

also has the advantage of lapping a large variety of precision type work in a minimum of time. Thus it provides an economical means for finishing large sealing and wearing surfaces, or surfaces that are to be subsequently drilled or milled on soft metal parts, because no cleaning of the parts to remove embedded abrasive is required after the lapping operations have been performed.

The bonded abrasive lap of this machine has the advantage of producing surfaces that require no subsequent polishing operations. The machine is provided with a truing device developed to facilitate maintenance of the original lap accuracy throughout its life. The bonded abrasive lap is said to have a long, useful life and to be easy to replace because of the segmental design.



Lapping machine built by the Norton Co. for rapid, accurate finishing of large flat surfaces on soft metal parts

Machine Tools, Unit Mechanisms, Machine Parts, and Material-Handling Appliances Recently Placed on Market

Edited by FREEMAN C. DUSTON

Colonial Transfer Press Built to Insert and Automatically Gage Valve Guides

A multiple-ram assembly press designed to operate in a fully automatic high-production transfer line with a maximum capacity for assembling 420 valve guides per hour in automobile engine heads has been announced by the Colonial Broach Co., Box 37, Harper Station, Detroit 13, Mich. Automatic inspection of the press fit assemblies is provided by a panel of red and green indicator lights. Observation of the lights shows the operator if the press fit of each part is within the desired tolerances, and whether rejected parts are too loose, or too tight to pass inspection.

In addition to the actual assembling, the machine is designed to accomplish several additional operations simultaneously. The engine heads are picked up at the loading station at the left and pulled into the second station by the transfer bar. Diamond-tipped locating pins are inserted into previously drilled and reamed "work holes" at each end of the casting, and the valve guide holes are brushed free of dirt and chips and then lubricated. At the same time, part numbers are stamped on the top of the head.

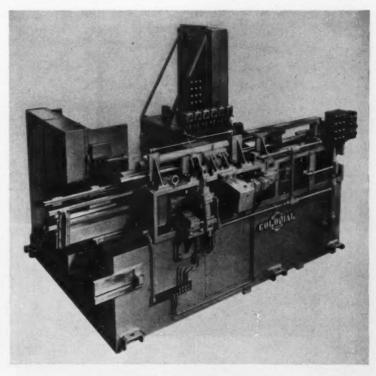
The head then moves to the assembly station where locating pins again engage the part. Rams pick up six valve guides from a gravity feed hopper of sixty-guide capacity, and press them in place with a hydraulic pressure of 400 pounds per square inch. Simultaneously, another head is pulled into the brushing and stamping station. After insertion of the guides, the heads are pushed out between guide rails to the unloading station ready for the subsequent machining operations.

The machine is approximately 8 feet long, 6 feet wide, and 8 feet high. Power is furnished by a 15-H.P. motor which drives a double hydraulic pump. Rams and other moving parts are located behind the machine for operator safety, but are accessible for servicing. Limit switches on each ram automatically stop the machine if any part is too large for pressing, thus eliminating breakage of parts or damage to the machine or fixtures. A limit switch at the unloading station prevents operation

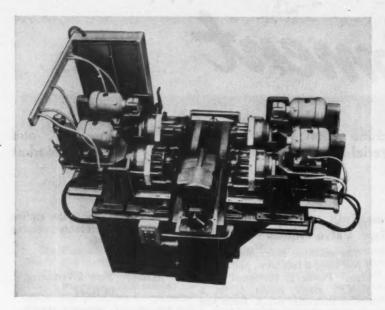
of the machine until the station is clear, and so prevents jamming of completed parts.

Midget Size Grinding Wheel

The Chicago Wheel & Mfg. Co., 1101 W. Monroe St., Chicago 7, Ill., is now producing what is believed to be the world's smallest commercial mounted grinding wheel or abrasive point. These miniature mounted wheels are only 1/16 inch in diameter, and are extensively used for grinding extremely small and accurate holes.



Transfer type press built by the Colonial Broach Co, for inserting valve guides in heads of automobile engines

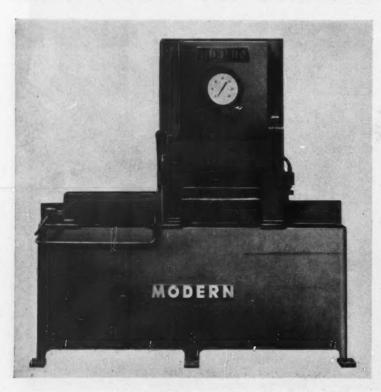


Zagar special machine for drilling and tapping transmission cases

Zagar Automatic Machine for Drilling and Tapping Transmission Cases

Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio, has designed and built a special two-station machine to drill and

tap six power take-off holes on each side of seven different transmission cases. The patterns or positions of the holes to be drilled



Machine built by Modern Industrial Engineering Co. for pressure testing water jacket areas of cylinder heads to detect leaks

and tapped are essentially the same on all cases, but the relative locations of the hole patterns are different. Therefore, the machine is designed with angular, sidewise, and vertical adjustments to accommodate the different positions of the holes in several transmission cases.

The machine consists of four hydraulic feeding units and four gearless drill heads. The first station has two opposed drill heads which drill six holes each in both sides of the case. A transfer unit moves the case from the drilling to the tapping station. Upon completion of the tapping, the transfer unit returns the work to the unloading position. The cycle is completely automatic.

The four Zagar feeding units are standard equipment, as are the four gearless drill heads. However, making provisions for the hole patterns in the heads, as well as the adjustments for drilling angles, required special engineering. The machine is completely lubricated from a central system.

Conveyor Type Machine for Pressure Testing of Water Jackets

A new automatic conveyor type pressure testing machine that checks water jacket areas of castiron cylinder heads of automotive engines is announced by the Modern Industrial Engineering Co., 14230 Birwood, Detroit 4, Mich. The machine receives the heads from a conveyor line, automatically seals them in three planes, checks for leaks by measuring air pressure loss, stamps parts that pass tests, and then returns them to the conveyor.

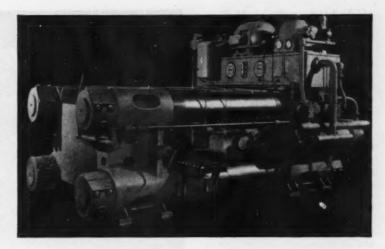
In testing, the water jacket areas in the head are automatically sealed by rubber-faced hydraulically operated pads. When the sealing pads contact the cylinder head, the resulting pressure build-up in the hydraulic circuit causes the air-test cycle to start.

The head is then charged with a specific volume of air that is trapped in the jacket areas. Pressure loss over a specified time determines the condition of the casting. A red light indicates parts that do not pass the test. A green light indicates satisfactory parts which are automatically stamped "OK" by the solenoid-operated marking device.

Lake Erie Billet Splitter for Artillery Shells

One of America's largest steel fabricators has installed a hydraulic press for the breaking of steel blooms used in the production of medium and large artillery shells. The horizontal column type press was built by the Lake Erie Engineering Corporation, Box 68, Kenmore Station, Buffalo 17, N. Y. It exerts a maximum force of 1500 tons, and is designed to split blooms ranging from 5 to 20 feet in length into billets from 5 to 24 inches long. The cross-sections of these billets range from 5 to 12 inches square.

Actual breaking is accomplished by a large anvil mounted on a moving platen which is driven toward a resistance platen supporting two other anvils. These latter anvils form a nest for the moving anvil. Features of the press include a 9-foot roller con-



Press for splitting steel billets built by Lake Erie Engineering Corporation

veyor to permit easy loading and unloading, and a specially designed hydraulic circuit in which the pull-back cylinders function as shock absorbers.

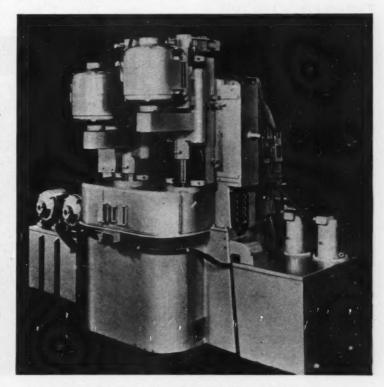
Springfield Dual-Spindle Vertical Grinder

Individually operated spindles, provided with individual controls which are not interlocked, and self-centering centrifugal chucks are features of a dual-spindle vertical grinder brought out by the Springfield Machine Tool Co., Springfield, Ohio. The features incorporated in this machine are said to permit easy, rhythmic operation that is almost continuous in nature.

On production work the lefthand spindle may be in operation while the right-hand spindle head is retracted for unloading and loading. The work is set in the chuck of the non-operating unit, and as the table begins to revolve, the centrifugal force causes the jaws to grip the work and hold it securely throughout the complete grinding cycle.

When the table stops at the end of the cycle, the jaws automatically open with the cessation of the centrifugal force and allow the operator to lift out the finished piece and replace it with an unfinished one. The illustration shows the left-hand unit operating while the head of the right-hand unit is retracted for loading.

A typical automatic cycle which is identical for the two production units is as follows: rapid traverse until wheel contacts work; automatic starting of grinding feed; final sizing and fine finishing; and quick return of the wheel-head to the starting position. Control buttons and switches are duplicated for each of the two units. The "mushroom" buttons are for emergency stopping, and the thumb buttons beside them are for full-cycle starting. Panels at the operator's position have switches which set the cycle for either automatic or manual control of the work-table, coolant flow, head setting, diamond dresser actuation, and compensation for wear of the grinding wheel.

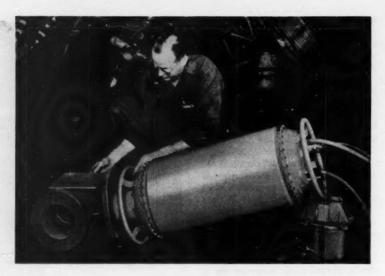


Dual-spindle vertical grinder brought out by Springfield Machine Tool Co.

G-E Midget Type X-Ray Machine

A midget type 250,000-volt industrial X-ray machine, less than half the size and one-eighth the weight of the conventional 250,000volt unit, has been brought out by the General Electric Co., X-Ray Department, 4855 Electric Ave., Milwaukee 14, Wis. This lightweight mobile unit, although capable of X-raying steel up to 3 1/2 inches in thickness, can be easily carried around in foundries, welding shops, shipyards, and building projects, and on many other jobs where X-ray inspections are needed to control quality and safety.

The unit is less than 15 inches in diameter, is 44 inches long, and weighs only 150 pounds, as against 1150 pounds for conventional units. The first major application has been in U.S. Navy shipyards, where it is used to inspect critical welded seams and stressed areas in ships during and after construction. A feature of the unit is the protruding "snout" from which the X-rays are emitted, making it possible to take "inside out" X-ray pictures. This facilitates, for example, inspection of a section of a welded pipe joint. When operating at from 75,000 to



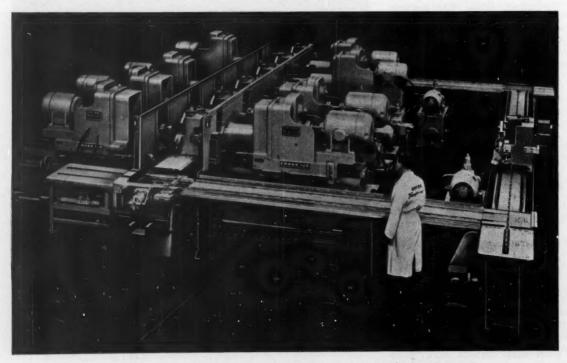
Lightweight mobile X-ray machine brought out by the General Electric Co.

250,000 volts, the new unit can be used on any metal from magnesium to steel. Use of the machine on light metals is also aided

by the beryllium "window" of the X-ray tube, which allows the escape of softer, less penetrating X-rays from the tube.

Cross Transfer-matic Produces Tank Idler Arms

Defense production of tank idler arms has been stepped up considerably by means of a Transfermatic recently delivered by The Cross Company, Detroit 7, Mich. The machine is designed to finish six and one-half tank arms per hour. Operations include coredrilling and reaming a small hole, and hollow-milling a boss around



Transfer-matic built by The Cross Company for machining tank idler arms

the small hole; rough- and semifinish boring a large hole; and trepanning a groove on one end.

There are six stations—one for loading and five for machining. Because of the odd shape of the idler arms, special fixtures are used to hold each part securely during all operations. An integral conveyor returns the fixtures

from the last station to the loading station.

One of the features of the machine is the use of pre-set tools to reduce "down" time. Another feature is the Cross Cutter-Drive, which facilitates tool changing, and also contributes to speed production. Electrical and hydraulic units conform to J.I.C. standards.

Landis Plain Grinder for Large-Diameter Work

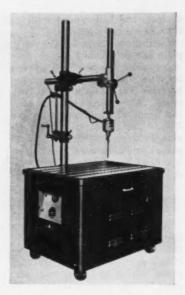
A new line of plain grinders for large-diameter work has been developed by the Landis Tool Co., Waynesboro, Pa. This machine, designated the "CHW" plain grinder, is available in swing capacities of 30, 36, and 48 inches, and with between-center capacities of 48, 72, 96, and 120 inches. It is designed for accurate, efficient grinding of parts such as turbo-jet engine rotors, track carriers, large-diameter motor armatures, water valves, and similar large-size work or parts with projecting members.

A 10- or 15-H.P. motor is used to drive the 30-inch diameter grinding wheel, the size of driving motor selected depending on the work to be ground. A variable-speed headstock drive is standard equipment, but a con-

stant-speed drive is available for use when desired.

The double slide under the wheel-head is designed to allow for the large amount of base movement required on machines of this type. This slide is manually positioned, but can be supplied for power operation. The slide ways, as well as the work carriage ways, are pressure lubricated with filtered oil from a separate reservoir.

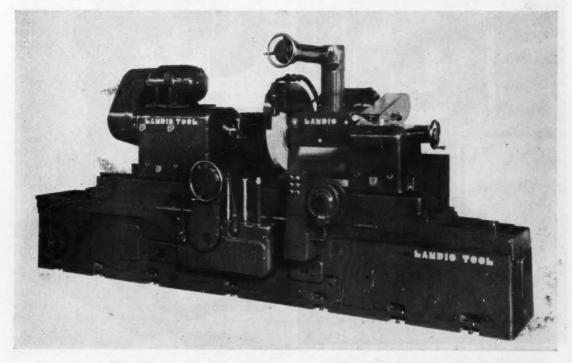
The hydraulic table traverse is adjustable to any desired speed between 3 and 130 inches per minute. The swivel table can be adjusted to grind tapered work. The wheel spindle runs in Landis "Microsphere" bearings, which have a spherical outer form, are babbitt lined, and can be quickly and easily adjusted for clearance.



Broken tap and drill remover of improved design

Electro Arc Broken Tap and Drill Remover

The Electro Arc Mfg. Co., Box 448, Ann Arbor, Mich., has brought out a Model 1-S metal disintegrator with a cast-iron work-plate 28 1/2 by 39 1/2 inches. This plate has a ground



Plain precision cylindrical grinder for large-diameter work introduced by Landis Tool Co.

surface, and is provided with T-slots to simplify set-ups.

Castings too large for the workplate can be handled on the floor or by using the auxiliary ground terminal and chucking the disintegrator head in the radial drill press. Air can be used as a cooling agent where liquid is prohibitive. The radial arm is adjustable through 360 degrees in all planes, and allows the disintegrating head to operate at any predetermined compound angle. The mounted head has a positive automatic 20-inch travel and is interchangeable on all of the manufacturer's disintegrating machines. It will disintegrate metals capable of conducting electricity, and provides high cutting speeds for use in the removal of broken taps, drills, reamers, pins, screws, studs, etc., from any kind of metal, including aluminum, without damage to either the original threads in the hole or to the work-piece.

at any speed up to 6 inches per minute and with any approach speed up to 30 inches per minute. The clear working space is 6 feet high and 6 feet between columns.

In order to duplicate the action of single-ram machines for load holding and instantaneous return, two concrete block counterweights weighing 10,000 pounds each (approximately 72 cubic feet) are used in place of the customary pull-back hydraulic cylinders. Large, double roller chains running over sheaves on top of the cross-head support the blocks.

The testing machine has three ranges: 0 to 600,000 pounds; 0 to 120,000 pounds; and 0 to 30,000 pounds. Three dials, 16 inches in diameter, serve to indicate loads.

Baldwin Testing Machine

A testing machine of unusual specifications has been built by the Baldwin-Lima-Hamilton Corporation, Philadelphia 42, Pa., for proof testing hydraulic type aircraft landing gear at the plant of the Menasco Mfg. Co., Burbank, Calif. This 600,000-pound compression testing machine consists of a hydraulic loading cylinder mounted as a fixed cross-head on two 9-inch diameter steel columns

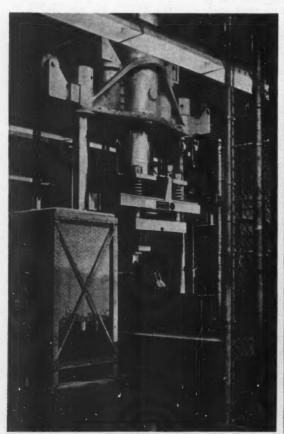
set in a bedplate at floor level. Loads are applied by a two-speed 21-inch diameter ram with 4-foot stroke. The load can be applied

High-Speed Automatic Stamping Press

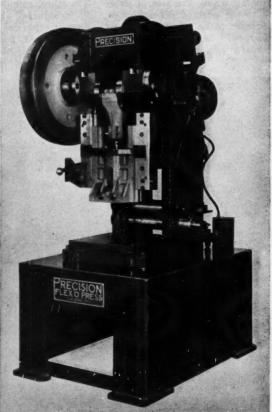
The Precision Welder & Flexopress Corporation, 138 E. Mc-Micken Ave., Cincinnati 10, Ohio, has brought out a "C" type high-speed automatic stamping press

of 30-ton capacity which has built-in feed rolls. This press embodies several new features.

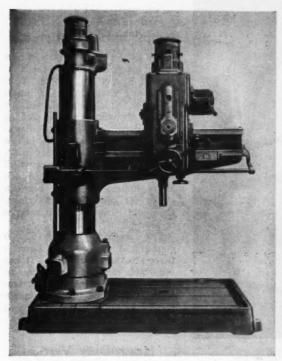
Both the ram and the connecting link are of high-strength,

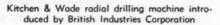


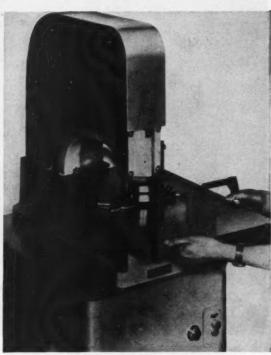
Hydraulically operated compression testing machine built by Baldwin-Lima-Hamilton Corporation



Stamping press with roll feed built for high-speed operation by Precision Welder & Flexopress Corporation







Di-Acro power-operated punch press recently developed by the O'Neil-Irwin Mfg. Co.

light alloy material which reduces the weight of these members approximately 35 per cent. The press ram is mounted in multiple ball bearings, operating in hardened and ground tool steel raceways designed to insure accurate alignment. The roll lift is adjustable in ten steps to accommodate material of different thicknesses.

Feed rolls built as an integral part of the machine are infinitely adjustable to provide any desired amount of feed from 0 to 12 inches per stroke. The square pillow blocks are cross-bolted for journal bearings with replaceable inserts. An outstanding feature of this automatic press is its wide versatility in feeding and stamping materials ranging from 0.002 inch thick aluminum foil, plastics, gasket materials, and paper used in box construction to heavy metals up to its 30-ton capacity.

The machine is available with either an air- or a shot pin-operated clutch. Conventional bolster areas, shut heights, and ram adjustments are standard. The speed is infinitely adjustable from 110 to 450 strokes per minute. The Flexopress illustrated has a special 7-inch stroke instead of the regular 2 1/2-inch stroke.

Kitchen & Wade Radial Drilling Machine

The British Industries Corporation, International Machinery Division, 164 Duane St., New York 13, N. Y., is introducing in this country a Kitchen & Wade E-24 radial drilling machine with a 4to 6-foot radius, a 14-inch column, and a capacity for drilling holes 3 inches in diameter in mild steel. The radial arm is rigidly designed to withstand torsional strain, deflection, and natural sag from the weight of the head. The elevating mechanism has a special safety nut that prevents the arm from falling due to wear.

A two-way, three-way, or rightangle base can be furnished at extra cost. The spindle, of large diameter at the driving section, has a No. 5 Morse socket, and is balanced by a compensating spring device. The feed rack is cut integral with the spindle sleeve. Along the bottom of the arm is a vee which forms a guide for the head. Anti-friction bearings carry the weight of the head on the top of the arm. Four ranges of spindle speed can be provided, and there are four feed rates, 0.007 to 0.029 inch.

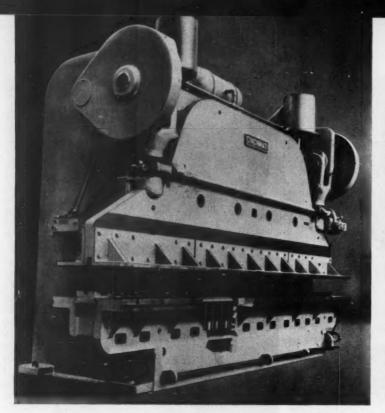
Di-Acro Power-Operated Punch Press

A power-operated punch press with a rated capacity of 5 tons has just been added to the Di-Acro line of the O'Neil-Irwin Mfg. Co., 559 Eighth Ave., Lake City, Minn. The press will punch a 4-inch diameter hole in No. 16 gage sheet steel, or a 3/8-inch diameter hole in 3/16-inch steel.

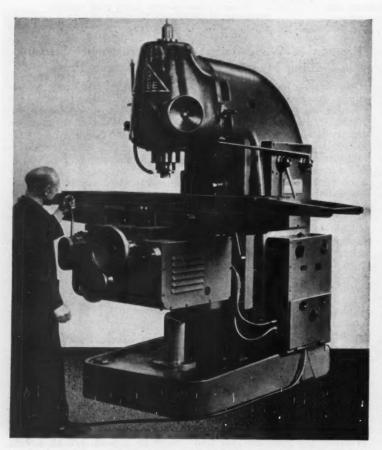
All moving parts are housed in a welded steel cabinet, a feature which assures both safety and good work visibility. The machine operates at 180 strokes per minute, and has a pedal control and a built-in chute for delivery of slugs and blanked parts. Two models, weighing 540 pounds and 715 pounds, are available.

Studs Made in New Sizes

The Northwestern Tool & Engineering Co., 115 Hollier Ave., Dayton 3, Ohio, announces the addition of new additional sizes to its line of cut thread studs. Studs can now be supplied from stock, 2 to 20 inches long, in 5/16-18, 3/8-16, 1/2-13, 5/8-11, 3/4-10, 7/8-9, and 1-8 sizes.



All-steel press brake brought out by the Cincinnati Shaper Co.



Nube heavy-duty vertical milling machine introduced by Kurt Orban Co., Inc.

Cincinnati Press Brake with Special Equipment

An all-steel press brake is now being manufactured by the Cincinnati Shaper Co., Hopple, Garrard, and Elam Sts., Cincinnati 25, Ohio, which can be used for shallow drawing work as well as conventional press brake operations. This press brake has a double plate bed 30 inches wide, and 15 feet 8 inches in over-all length. There are fourteen 6-inch air cylinders mounted between plates for operating draw-rings, knock-out bars, and similar types of accessories.

The machine weighs 72,000 pounds and has a speed of twenty-three strokes per minute. It has removable ram angles for press or brake operation. Additional features include air counterbalances and horns on each end of the bed and ram.

Heavy-Duty Vertical Milling Machines

Table sizes up to 80 by 20 inches, table movement accuracy within 0.0004 inch, and simple single-lever control are some of the advantages offered by the Nube heavy-duty, precision vertical milling machines being distributed in this country by the Kurt Orban Co., Inc., 205 E. 42nd St., New York 17, N. Y. Saddle ways are of the same length as those of the table, resulting in a high degree of accuracy even when working at the extreme ends of the table. The heavily ribbed knee is designed to obtain vibrationless operation.

All models are supplied with a horizontal as well as a vertical milling spindle. The vertical spindle head can be swiveled 45 degrees in either direction. Both spindles have axial adjustment, permitting simultaneous vertical and horizontal milling of a workpiece. A single control lever starts the spindles and engages the power feed and rapid traverse in any of the pre-selected directions. Speed changes are possible at all times. Speeds are engaged by magnetic clutches, and there is no idle time when shifting either spindle speed or table feed. The machines are readily adaptable to automatic cycling operation by means of trip dogs mounted on the front of the table.

"Aeroframe" Profiler and Milling Machine

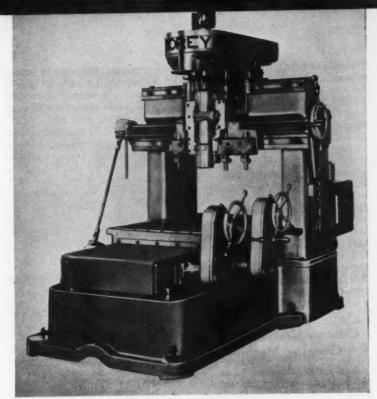
A machine specifically designed for the milling and profiling of large forgings and castings such as aluminum and magnesium airframes, as well as cast-iron parts and steel forgings, has been developed by the Morey Machinery Co., Inc., 410 Broome St., New York 13, N. Y. This profiler and milling machine, known as the Morey No. 40M heavy-duty vertical "Aeroframe," is designed to combine rigidity of construction with the power required to take full advantage of tungsten-carbide tools. It is equally well suited for taking heavy cuts in irregularshaped steel forgings and castings, and in cast-iron frames of computing, typesetting, and similar precision machine parts.

The two-speed 15-H.P. motor operates through a back-geared drive to provide a spindle speed range of 125 to 4600 R.P.M. Improvements incorporated in this new single-spindle, bridge style profiler and milling machine include a cross-head mounted in balance on a vibration-damped crossrail; bridge columns designed for the addition of raising blocks to increase bridge clearance; antifriction bearings throughout the machine; simple adjustment for taking up all backlash in control gears, which enables the operator to mill work to very close tolerances; and one-shot lubrication.

The profiler has both taper and straight follower holders, and the machine can be supplied in any table length up to 10 feet. Copying attachments are available for all movements.

Dial Riveting Equipment

A dial type automatic rivet setting machine made by the Chicago Rivet & Machine Co., 9600 W. Jackson Blvd., Bellwood, Ill., is designed to provide greater speed in tubular riveting by simplified loading and control mechanisms. In addition, hazardous conditions encountered in riveting small or awkward parts are eliminated. Featuring a 40-inch diameter rotating dial equipped with twelve fixture stations, the equipment feeds and clinches three tubular rivets simultaneously in one single and one double standard automatic rivet setter. The unit illus-



Heavy-duty vertical "Aeroframe" profiler and milling machine placed on the market by the Morey Machinery Co., Inc.



Dial type rivet setting equipment developed by Chicago Rivet & Machine Co.

trated was built for setting three tubular rivets in an automobile horn assembly. Clamping fingers automatically close after each fixture leaves the loading position, then open after leaving the second of the two riveting positions.

The machine is designed for continuous operation, but an operator-controlled foot switch will immediately stop the riveting in order to correct an error in loading. The dial is driven by a Geneva gear mechanism actuated through a Graham transmission that permits an adjustable control of the rotating speed. Stations are indexed against a positive stop, and the rivet setters tripped by solenoids operated by a micro-switch.

Clayton Kerrick Steam Cleaning Machine

A steam cleaning machine, capable of discharging up to 540 gallons an hour of pressure detergent spray and up to 540 gallons per hour of hot or cold pressure rinse simultaneously, has been announced by the Clayton Mfg. Co., El Monte, Calif. This machine has been designed to solve the cleaning problem in any operation requiring large-scale cleaning. It is equipped with a 60-gallon detergent concentrate tank and a 40-gallon fuel tank, and will operate for four hours continuously at maximum load.

The vapor generator operates

with a thermal efficiency in excess of 80 per cent under all loads, while the pressure atomizing burner system operates efficiently on common, low-cost fuels.

The machine is supplied with a cleaning gun, a rinse gun, two sets of delivery hoses, and 150 feet of heavy-duty electrical cable. The equipment operates on 220-volt, 60-cycle, single-phase current. It is 48 inches high, 88 inches long, and 34 inches wide, and weighs 2000 pounds.

Murray-Way Polishing Head for Rapid Deburring of Turbine-Disc Slots

A polishing head, developed especially for fast, accurate, and economical deburring of turbinedisc slots, which incorporates several universal positioning features has been announced by the Murray-Way Corporation, Birmingham, Mich. This new head can be used with either wheels or buffs, and is adaptable for a wide range of polishing operations in the jet engine and other fields.

The exceptionally compact design of these new heads permits several of them to be used effectively in a closely grouped assembly as shown in the accompanying illustration. In the turbine-disc slot deburring operation, two, three, or four heads are used as required, the heads being easily dropped or added as needed.



Denison Multipress equipped with "Touch Control"

Denison "Touch Control" for Multipress

A versatile type of control has just been brought out by the Denison Engineering Co., Dublin Road, Columbus 16, Ohio, for use on its Multipress. This device, known as "Touch Control," is a servo type valve-actuating unit. By controlling the oil-hydraulic press circuit through movement of the hand-lever, instant response for any desired ram action is obtained.

The ram can be moved slowly or rapidly, as desired, its movement corresponding to that of the control lever. Thus, fast or slow movements and long or short



Clayton Kerrick heavy-duty steam cleaning machine



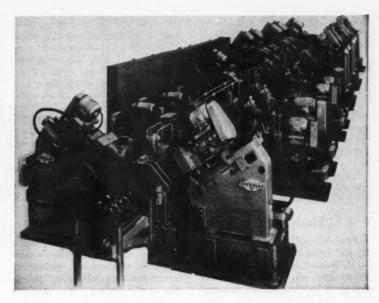
Polishing heads developed by Murray-Way Corporation

strokes of the ram are under instant control of the operator. The minimum ram stroke is about 1/16 inch, and the maximum stroke 6 to 15 inches, depending on the model Multipress used. When the ram contacts the work, it exerts just as much force as the pressure of the operator's hand on the control lever dictates. The pressure gage on the press indicates the exact force needed to perform a certain job.

Mechanical Metal-Cleaning Systems and Equipment

A line of general-purpose metalcleaning equipment has been designed by the J. P. Mfg. Co., 330 E. Front St., Youngstown 3, Ohio. The units combine high-pressure immersion degreasing, washing, stripping, and cleaning in one automatic operation. Complete equipment is available for derusting, descaling, pickling, and corrosion removal; high-pressure rinsing and anti-rusting preparation; bonderizing, phosphatizing, rustproofing, and paint bondingall with simultaneous extraction of the deposits from the solutions. Newly developed alkaline, spirit, petroleum, emulsion, and acid types of cleaning solutions are available for this equipment.

Powerful motorized propellers drive the solutions at exceptionally high speed, creating high-

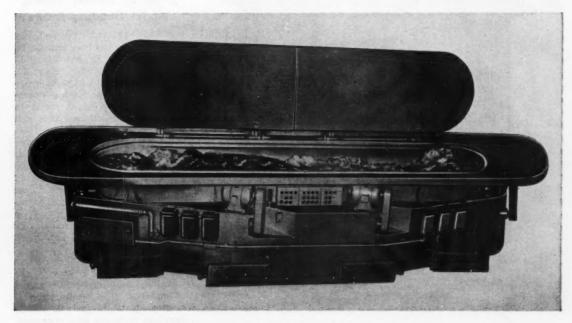


Transfer machine for vee type engine blocks built by Greenlee Brothers & Co.

pressure shearing impact against the surfaces of the parts. Units can be equipped with motorized revolving baskets which rotate the submerged parts while in process, and electrically operated "open-stop-close" lids for hooded enclosures of conveyorized cleaning units are available. The units are complete with electrical controls, pilot lights, motors, and are supplied with automatic gas, steam, electric, or oil heat.

Greenlee Transfer Machine for Vee Type Engine Blocks

A high-production line processing vee type engine blocks now includes an eighteen-station automatic transfer machine recently built by Greenlee Brothers & Co., Rockford, Ill. A total of 110 drilling, reaming, boring, counterboring, and core-drilling operations are performed every 38.3 seconds on the blocks moving through the



High-pressure whirlpool cleaner developed by the J. P. Mfg. Co.

machine. In this new machine, seventy-five blocks are processed per hour. Upon entering the 74-foot unit illustrated, a turnover fixture at the first station raises each block and rotates it 180 degrees. (The blocks are received from the preceding machine panrail up.) Another turnover fixture at the seventh station raises the work and rotates it 360 degrees to remove the chips which have accumulated inside the block.

The heads at four stations are cross-feeding units that drill and bore the starter mounting holes parallel to the axis of the block. They do this by advancing to position, cross-feeding the tools, then retracting the tools clear of the work, thus permitting its transfer to the next station. Four other stations are left untooled, serving as inspection points and for the removal of the work if necessary.

All the hydraulic and electrical circuits are readily accessible, and meet J.I.C. standards. Each working station can be reached from either side of the head.

"Flash" Lathe Speeds Secondary Operations

Production of an automatic "flash" lathe is announced by the J. M. Nash Co., 2360 N. 30th St., Milwaukee 45, Wis. Originally designed for the plastics industry

to handle various finishing operations on circular moldings—parting-line flash removal, gate trimming, grooving, abrading, polishing, and buffing—the machine

Ten-station "flash" lathe produced by the J. M. Nash Co.

finds equal usefulness in the metal trades. Flash-trimming die-castings and deburring small round metal parts are typical jobs.

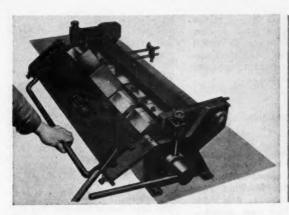
The machine consists of a tenstation rotary table, each station being equipped with a work-holding spindle which revolves around its own axis. A vertically adjustable top wheel contains ten corresponding pressure spindles which retract by means of a cam for unloading and reloading. The speed of the work-holding spindles can be varied between 700 and 2000 R.P.M. These spindles, if necessary, can be provided with collets, eliminating the pressure spindle assembly.

Indexing of the table is automatic and continuous, and is pneumatically performed under an electrical control system. Work diameters up to 4 1/2 inches can be accommodated, and the unit has a height adjustment of 8 inches. Tooling supplied by the manufacturer, which can be arranged in a 140-degree arc on the platen around the rotary table, consists of motor-driven buffing units, carbide file flashing units, micrometer - adjustable cutters, crimping rolls, revolving knives for height trimming, grooving knives, and grinding wheels. It is possible to develop special tooling for specific finishing work.

Dreis & Krump Bench Model Bending Brake

A hand-operated, universal, box and pan brake has been announced by the Dreis & Krump Mfg. Co., 7400 S. Loomis Blvd., Chicago 36, Ill. This brake has the capacity required for any bending operation on 18-gage sheet metal in lengths up to 24 inches. It is well suited for use in model and experimental shops, as well as for long-run production work.

The bending edge of the brake is made up of fingers in graduated widths which fit a bar. These fingers are easily adjusted or removed as the work requires. They can be used in combination for folding, box and pan work, and in a limitless variety of straight bending operations. The positive cam-action clamp is quickly adjustable for different thicknesses of material. The bending leaf is a steel plate hinged in needle bearings to insure easy operation. Angularity of the bend is con-



Hand-operated bench brake recently introduced by the Dreis & Krump Mfg. Co.



DeWalt machine developed for use in cutting gates and risers from large castings

trolled by an adjustable stop which assures accuracy in duplicate work. This bending brake will make minimum reverse bends of 1/4 inch. The maximum angle of bends is 135 degrees, and the maximum box depth is 3 inches.

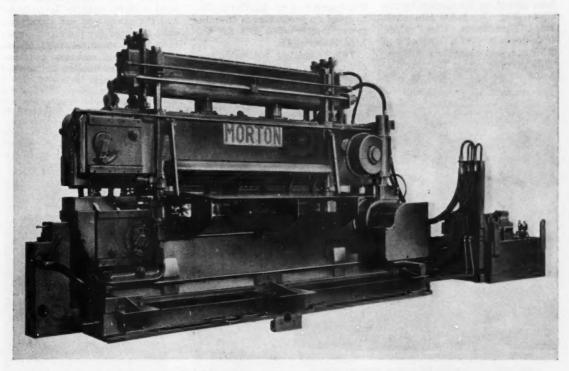
Machine for Cutting Gates and Risers from Castings

DeWalt Inc., Lancaster, Pa., a subsidiary of the American Machine & Foundry Co., has built a machine designed for cutting the gates and risers from large castings. This machine is so constructed that the cutting can be done with the radial arm positioned above the work-table. For castings which are too large to be placed on the table, the arm can be swung behind the table, and the gates and risers can be removed with the casting resting on the floor.

Morton Rolling Mill Flash Trimmer

The Morton Mfg. Co., Broadway and Hoyt, Muskegon Heights, Mich., has brought out a rolling mill flash trimmer for use in conjunction with an electric welder which joins steel coils into a con-

tinuous strip ready for pickling and scale removal. The trimmer is installed in the rolling mill, immediately adjacent to the welder. After the strips are joined, they are advanced to the approximate



Rolling mill flash trimmer brought out by the Morton Mfg. Co.

center of the trimmer, the machine automatically aligning itself laterally with the strip, which is then secured by hydraulically actuated clamping dies. An upper and a lower ram, each carrying five adjustable tool-holders and cutting tools, operate in hardened ways in their respective housings. The rams, powered through a chain drive to a reversing type motor, are simultaneously traversed across the strip to remove the flash.

A push-button controls the clamping of the strip and the lowering of the upper housing. At the end of the fixed travel, limit switches open the dies and raise the upper housing, and the rams return to the front of the machine. This trimmer ordinarily handles strips 0.056 to 0.250 inch thick. The machine has a 3-inch vertical movement and clearance between the dies. Both rams can be quickly removed for inspection, and the cutting tools can be replaced without disassembling any other part of the machine.

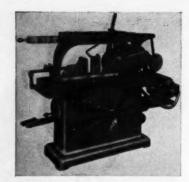
Multiple-Head Tungsten-Carbide Surface Grinder

A machine for production grinding of solid carbide blanks has been placed on the market by the Spike Mfg. Co., 24609 Middlebelt Road, Farmington, Mich., which is designed to give a finish of 1 to 2.5 r.m.s. and gage block flatness. This grinder uses a 150 grit diamond wheel and is said to hold

work to size within plus or minus 0.0002 inch. A patented process makes it possible to true the wheel in a few minutes. Diamond salvage of less than 1 carat per pound of sludge is obtained.

Keller Hacksaw with Increased Capacity

A larger power hacksaw has just been added to the Keller line, according to an announcement by the Sales Service Machine Tool Co., 2363 University Ave., St. Paul, Minn. The new modelknown as the No. 5 Hi-Duty Keller power hacksaw-has a capacity for 9 1/4-inch round stock or 8- by 9-inch flat stock. Features of the saw are a cabinet base, an automatic reverse stroke lifting mechanism, and a foot lever to hold the frame in position while loading, unloading, or setting the saw blade. Cutting pressure can be



Keller power hacksaw announced by the Sales Service Machine Tool Co.

regulated by an easy-operating control wheel, enabling the saw to cut any material from light tubing to heavy shafting.

The saw is equipped with a quick-acting swivel-base vise, an integral coolant pump, a 1-H.P. motor, and an automatic stop switch.

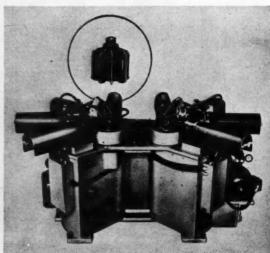
Machine for Rapid Drilling of Mortar Shell Fins

Eight drilling units of the traversing motor shaft type made by the Black Drill Co., Inc., 1400 E. 222nd St., Cleveland 17, Ohio, are incorporated in a special machine designed and built by the Bartelt Engineering Co., Rockford, Ill., to speed up production of 60-millimeter mortar shell fins for the Line Material Co.

This completely automatic machine has two stations which can be unloaded and loaded at the end of each cycle by one operator. The machine drills sixteen 5/16-inch holes in each fin, first drilling four upper holes, then indexing 180 degrees and drilling the remaining four upper holes. The work-holding spindle is raised, and the operations are automatically repeated for the eight lower holes. The machine maintains a high degree of accuracy and has speeded up production to 300 to 400 fins per hour.



Multiple-head machine for surface grinding carbide blanks, marketed by Spike Mfg. Co.



Special machine built by Bartelt Engineering Co. for drilling mortar shell fins

Vinylite Plastic Rigid Sheet Drawing Material

The Bakelite Co., a Division of Union Carbide and Carbon Corporation, has announced that a durable new type of drawing material made of translucent Vinylite in plastic rigid sheet form to facilitate the making and reproduction of engineering drawings is being produced by the Di-Noc Co., 1700 London Road, Cleveland 12, Ohio. This material will not shrink or stretch, and is resistant to moisture, oil and grease, alcohol, and most chemicals.

Finger marks and smudges can be removed from the sheet with a damp cloth. Border, title and information box, and grid lines are printed in reverse on the back of the sheet. These lines and other printing facilitate making the drawing and reproduce clearly along with the drawing itself when the sheet is used as a negative to make copies, yet do not hamper the draftsman since they are on the reverse side of the plastic sheet.



Vinylite plastic drawing sheet made by Di-Noc Co.

The Vinylite plastic rigid sheet lies flat or can be rolled up, and it resists wrinkling, cracking, fraying, and aging. Erasures are easy to make, and entire drawings can be removed from a sheet which can then be re-used.

"Super Hard" Drill Sizes

The Super Tool Co., 21650 Hoover Road, Detroit 13, Mich., has increased the range of standard sizes carried in stock of its "Super Hard" carbide drills specially designed for drilling hardened steel. There will now be eleven sizes stocked—1/8 to 1/2 inch in the standard round shank: style (solid carbide end); and ten. sizes—5/16 to 3/4 inch in the hexagonal shank style (carbidetipped). These tools find wide application in the drilling of tools, dies, fixtures, etc., that require corrections after hardening.

"Gritcloth" Open-Mesh Sanding Cloth Eliminates Clogging

An abrasive sanding cloth of open-mesh design developed to eliminate trouble from clogging by letting the removed particles flow through the mesh openings, has been brought out by the Bay State Abrasive Products Co., Westboro, Mass. This simple feature is said to give the sanding cloth a long useful life, since it makes it possible for the sharp abrasive particles to cut more effectively for a considerably longer period of time.

Thriftmaster Angular Drilling Head

Thriftmaster Products Corporation, 1014 N. Plum St., Lancaster, Pa., recently developed a multiple-spindle, fixed-center drilling head of unusual design. The head drills a circle of twelve 1/4-inch holes, all of which are toed in 10 degrees toward center, in the trap of a high-explosive anti-tank rocket. The twelve spindles of the attachment have a 1 to 3 gear ratio with the drilling machine, and since the head is attached to the quill, all spindles feed into the work as a unit.



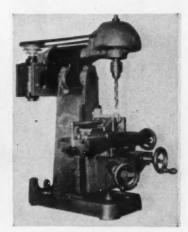
Improved Hardness Tester for Thin Sheet Steel

Hardness tester of 3-inch capacity manufactured by the J. P. Newman Co., 821 S. Raymond Ave., Alhambra, Calif. Improved features include the addition of A and D scales to the C-B and E scales. This feature enables the operator to test very thin sheet steel. Another outstanding improvement is the visual means for setting the instrument to the different load factors for the various scales used, thus preventing mistakes from being made when setting up machines.



Adapter for Price "Benchmaster"

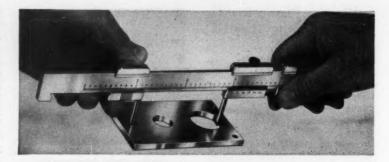
The D. W. Price Corporation, 11161 W. Pico Blvd., Los Angeles 64, Calif., now has available an adapter that greatly increases the capacity and versatility of its Benchmaster milling machine. With the addition of the adapter, the height between the table and the spindle is increased 50 per cent. As a result, larger drills or a standard dividing head or turntable can be used, and larger work-pieces can be accommodated. Because of its trunnion design, the adapter simplifies angular milling



and drilling operations, it being practical to position the spindle at any point from a vertical to a horizontal plane. Also, by pivoting the adapter to either side of the machine and fixing the spindle vertically, the effective length of the table can be increased from its original 12 inches up to a maximum of 18 inches.

Direct-Reading Center Distance Vernier Calipers

Sorensen Center-Mikes, Inc., 264 Kossuth St., Bridgeport 8, Conn., has developed an instrument to read the center distance between two holes directly, without the preliminary need of c'etermining hole diameters. Basically, it is a vernier gage and slide-rule combined. In operation the instrument is first set to the closest points of the two holes, and then, as in the illustrated view, lit is reset to the farthest points of the same holes. While the user makes these



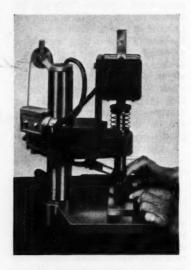
settings, the two distances are automatically registered and their average computed. This value appears on a double size vernier scale, and equals the center distance between the holes. It is also possible to measure the distance from the center of a hole of unknown diameter to a straightedge. Three sizes of these calipers are available, with a center distance range of 0.240 inch to 4.40, 7.40, and 12.40

inches, respectively. Carbide leg contacts enter holes 0.20 inch or larger, and they can be fitted with supplementary contacts for holes as small as 0.061 inch in diameter.

Height Gage Clamp and Scriber Show Refinements

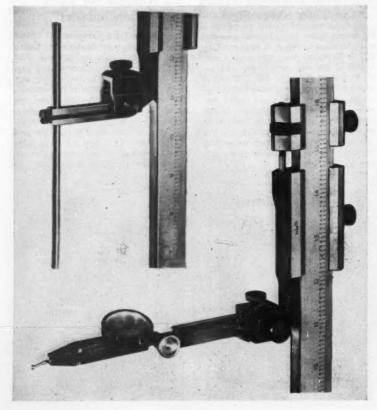
Vernier height gages made by Homestrand, Inc., Larchmont, N. Y., have two handy features. A redesigned clamp makes possible a direct interchange between the scriber of the gage and the rectangular shank of any of the popular makes of dial indicators.

It is no longer necessary to improvise a strap or other means of attaching the indicator to the gage. Also, the back of the scriber has been provided with a through hole and thumb-screw so that when the scriber is reversed in the clamp, a depth rod can enter the hole.



All-Electric Staking Machine

Improved all-electric staking machine called the "Electrostake" has recently been developed by Black & Webster, Inc., Department N74, 445 Watertown St., Newton 58, Mass. Basic advantage over conventional stakers consists of powering the machine by a solenoid rather than a spring-loaded trip-hammer. Both the hold-down pressure and the staking blow are fully adjustable. A portable machine, the Electrostake is suitable for any assembly line operation where two or more parts must be pressed firmly together and then staked or riveted with a sharp blow. Eyeleting, upsetting, and rolling can also be performed on the machine. The electrically powered work stroke is actuated from a treadle, leaving both hands free to hold the work in the fixture. As a safety feature, the staking blow cannot occur if the operator's hands are between the pressure pad and the work. The staking blow can only occur when the pressure pad is in full contact with the work.



Wheel Dresser for Cylindrical Grinders

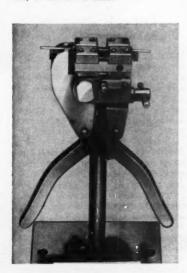
Emery wheel dresser brought out by L. Newman, 1001 Twenty-Fourth St., Oakland 7, Calif., for use on cylindrical grinders with either straight or tilted table. Illustrated view shows arm set at angle with dressing wheel block



midway in slot. Arm can be set vertically and block raised to end of slot. Replacement wheels are available.

Koldweld Process "Pliers"

Plier-like tool developed by the Utica Drop Forge & Tool Corporation, Utica 4, N. Y., for cold pressure butt-welding aluminum and copper wire. Both wire ends are aligned and gripped in dies while the handles are squeezed together. Wire diameter up to 0.070 inch can be accommodated. Companion tool, utilizing similar principle, makes sandwich welds in aluminum sheet. The technique, known as the Koldweld process, produces a molecular flow between the parts being welded. Attendant work-hardening of the joint area makes it the strongest part of the wire or sheet. No flame, heat, filler metal, flux, or current is used.





Eberhardt-Denver Speed Reducer

Speed reducer developed by the Eberhardt-Denver Co., 1408 W. Colfax Ave., Denver 4, Colo. This Model 3L2 can be mounted in any of three positions—with the output shaft horizontal and above the input shaft; with the output shaft horizontal and below the input shaft; and with the output shaft in a vertical position. Top and bottom

surfaces of the housing are machined so that either can be used as a mounting base. The speed reducer will be available in nine different ratios. The distance from the center of the bronze worm-shaft to the center of the gear-shaft is 3.250 inches. The power transmitting capacity ranges from 3 H.P. down to 1/2 H.P.

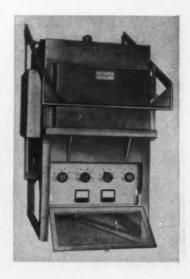


Porter-Cable Electric Hand Drills

Two models of electric hand drills introduced by the Porter-Cable Machine Co., Syracuse 8, N. Y. Both models have spindles with ball bearings constructed to absorb radial load and end thrust, Jacobs gear type chucks for slipproof gripping of bits, and powerful universal motors. The general-duty Model 107 with 1/4-inch chuck is designed for all-around intermittent use in shops, homes, and on farms. It has a full-hand pistol grip with push-button lock. The idle speed of 2000 R.P.M. adapts it for drilling in wood, metal, The special-duty and compositions. Model 109 with 1/2-inch chuck is built for intermittent production use where plenty of power is needed to penetrate metals and other resistant materials, as well as wood. It has double compound reduction gears and operates at an idling speed of 450 R.P.M. A removable auxiliary handle can be mounted on top or side of drill.

Heat-Treating Furnace for High-Speed Tool Steel

One of three models in a line of electrically heated hardening furnaces for high-speed tool steel announced by the Cooley Electric Mfg. Corporation, 38 S. Shelby St., Indianapolis 7, Ind. Operating temperatures cover the range of 1650 to 2500 degrees F. The following chamber sizes are available: 6 1/4 inches wide by 4 inches high by 9 inches long; 12 inches wide by 8 inches high by 18 inches long; and 12 inches wide by 8 inches high by 24 inches long. Power control is accomplished by use of multiple-tap transformers arranged for selection of voltages to be applied to the Globar heat elements located at the top and the bottom of the chamber. Temperature control is by means of a standard pyrometer arrangement. The furnace is heavily insulated by high-temperature refractories.





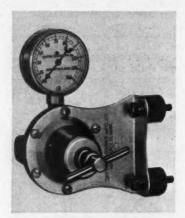
Reducing Regulator and Pressure Gage

Combination reducing regulating valve and pressure gage for all compressed air purposes announced by the Dayton Rogers Mfg. Co., 2829 Thirteenth Ave. S., Minneapolis, Minn. This device is furnished in four sizes for 1/4-, 3/8-, 1/2-, and 3/4-inch pipe thread connections. It will accurately regulate all secondary pressures up to 150 pounds. A special metal bracket and two vibration dampeners are furnished with each regulator and gage, to eliminate all shock and concussion blows



Bench Fixture Checks Internal Gears

A line of bench type internal gear rolling fixtures that check size, eccentricity, and roll smoothness, as well as face run-out, is announced by the Michigan Tool Co., 7171 E. McNichols Road, Detroit 12, Mich. Gears to be checked are loaded in a pot type chuck mounted on a vertical ball-bearing spindle, and a master gear is swung down by a levercontrolled eccentric into mesh with the gear to be checked. Size, eccentricity, and roll smoothness are registered on a 0.0005-inch indicator while the knurled pot chuck is rotated manually. Another 0.0005-inch indicator simultaneously shows face run-out of the gear. A control lever at the front of the fixture ejects the gear from the chuck. Three fixture sizes are available for gears up to 4, 7, and 12 inches outside diameter. Can be used with automatic recorder.



generated by the equipment. The regulating valve reduces the shop air line primary pressures to the desired lower secondary pressures automatically, thus it requires little attention.

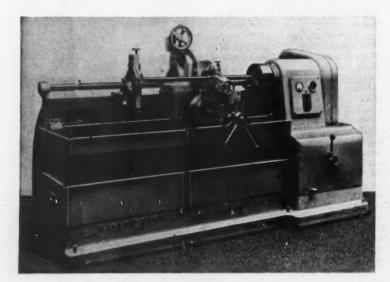
Ball Bearing for Use in Limited Space

Bushing type ball bearing for applications where space is limited announced by the Split Ballbearing Corporation, Lebanon, N. H. Its features include a split outer race with a section height of only 0.250 inch. The outer race is ground to close tolerance for press fit, and the bore is available in two types adapted to either press or slip fit. Both types will carry thrust and radial loads.



Cornelis Thread Generator

Newest Cornelis thread generator features a hydraulic variable spindle speed. The power unit contains a speed indicator and an ammeter to register any overload imposed on the cutter. George Scherr Co., Inc., 200 Lafayette St., New York 12, N. Y., is the distributor for the Belgian-made machine.



Portable Dynamic Balancing Machine

Model 652 "Vibratron" portable electronic machine designed for the analysis, evaluation, and correction of vibration and unbalance. This machine will measure accurately and without computation the amplitude and frequency of vibration and, by means of a stroboscopic light, discover its source. The "Vibratron" consists essentially of a vibration pick-up, a multi-channel electronic circuit, and a stroboscopic lamp arranged for operation on 110-volt 60cycle current. It can be integrated with a test stand for economical dynamic balancing of rotating parts in a range of from 600 to 40,000 R.P.M., or as a final production step in balancing complete machines before shipment. This equipment can be used in balancing

(This section continued on page 233)

B.S Productioneered

...for new high precision gaging

NEW Nº 955 ELECTRONIC CALIPER

Now you can measure work-in-process as close as .00001°— without removing the work from the machine, fixture, or bench.

Just apply the portable No. 955 Brown & Sharpe Electronic Caliper to the work and take your readings on the Electronic

Amplifier. This precision caliper with adjustable back rest for positioning the work is designed for fast, positive measurements

... it's "Productioneered" for precise quality control under mass production

conditions.

EXCLUSIVE ADVANTAGES

- Measures on the machine, fixture or bench
- Amplifier adjustable for readings in units from .0001" to .00001"
- Carbide measuring faces

BROWN & SHARPE MFG. CO.

- Only one master required for each setting
- Unaffected by dust or moisture
- Adjustable measuring pressure
- Aligning attachment for long work
- Easy to grip and apply to work

SEE NEXT PAGE FOR OTHER ILLUSTRATIONS AND SIZES

Brown & Sharpe

ductioneered

... for precise quality control on work from 0" to 4"



Nº 955 **Electronic** Caliper

Used in conjunction with the No. 950 Electronic Amplifier, the new No. 955 Brown & Sharpe Electronic Caliper allows you to measure precisely in units varying from .0001" to .00001" without disturbing the work set-up. A measuring range from 0" to 4" is provided by four interchangeable jaws that attach securely to the caliper body. Each jaw has a range of 1" and requires only one master for any particular measurement.

An aligning attachment, shown in illustrations above, is available for measuring long work pieces. Together with a spherical measuring point on the caliper jaw, this attachment provides a three-point bearing when the caliper is applied to the work . . . assures positive alignment and accurate readings.

ELECTRONIC CALIPER SETS

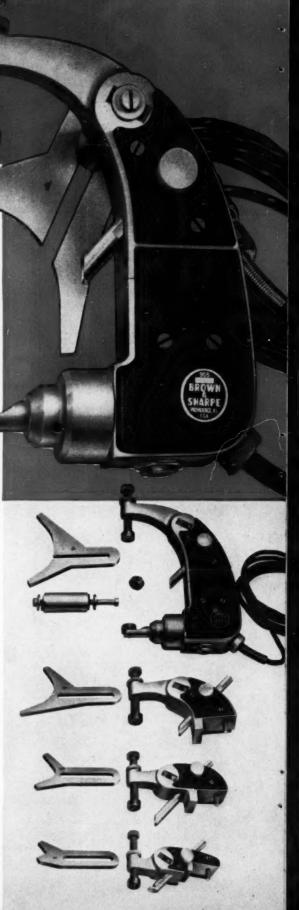
With the complete No. 956 set shown you can measure any size work from 0" to 4". It includes the caliper body, all four interchangeable jaws, and aligning attachment in a wooden case. The Electronic Caliper is also available in set No. 957, having the same range as set No. 956, but without the aligning attachment.

Write for new illustrated catalog describing the full line of Brown & Sharpe Electronic Production Measuring and Inspecting Equipment. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

WE URGE BUYING THROUGH THE DISTRIBUTOR

Brown & Sharpe

Milling Machines . Grinding Machines . Screw Machines . Cutters Machine Tool Accessories • Machinists' Tools • Johansson Gage Blocks Electronic Measuring Equipment • Permanent Magnet Chucks • Pumps



IBS POULATOR CARD Holes For Low-Cost Direct Measuring of Bores and Holes

New INTRIMIK Internal Tri-Point Micrometer



measuring bores and holes with the Brown & Sharpe Intrimik. It's a precision micrometer . . . not a comparator. Takes measurements directly. Intrimik eliminates the need for many expensive plugs and setting rings . . . it is "Productioneered" to cut costs and speedup machining of work requiring inside measurements. Every feature for convenience, precision, and long service life has been incorporated in its design and construction.

Now you can realize new economies and speed by

Brown & Sharpe

- As easy to read as a conventional micrometer

 measures bore or hole

 size accurately, disclosing exact amount of metal to be removed.
- Ratchet stop provides correct and unvarying measuring pressure.
- Self-aligning, axially and radially . . . three active measuring points automatically centralize tool in here.
- Extremely rigid , . . no interchanging of parts (except for extensions).

SEE NEXT PAGE FOR RANGE OF SIZES



New INTRIMIK

Internal Tri-Point Micrometer

The Brown & Sharpe Intrimik gives you a handy means of measuring inside diameters in increments of .0001" on bore sizes from .275" to .500"; and in increments of .0002" on bore sizes from .500" to 4.000". Where measurements must be taken over a range of sizes, Intrimik offers tremendous savings over plug and comparator type gages.

WIDE RANGE OF SIZES

Intrimik is furnished in 16 individual sizes, and also in four sets to cover all measurements from .275" to 4.000". Measurements at depths of 2" can be made with the three smaller sizes, and 3" with the larger sizes. Extensions are available to measure at depths up to 6" with the smaller sizes, and up to 9" with the larger. For even greater depths, two extensions may be used.

Write for the illustrated Bulletin describing the new Intrimik.

Intrimik with single extension for measuring deep holes.

WE URGE BUYING THROUGH THE DISTRIBUTOR

Brown & Sharpe BS

BROWN & SHARPE MFG. CO., PROVIDENCE 1, R. I., U. S. A.

Milling Machines • Grinding Machines
Screw Machines • Machine Tool Accessories
Cutters • Machinists' Tools
Electronic Measuring Equipment
Johansson Gage Blocks
Permanent Magnet Chucks • Pumps

a 1-ounce armature as well as a 200-H.P. generator. Product of International Research & Development Corporation, 908 W. Third Ave., Columbus 8, Ohio.

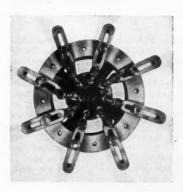


Improved Telescopes for Precision Alignment

Micro-alignment telescopes are now available with a built-in reflection unit. Distributed by the Engis Equipment Co., 431 S. Dearborn St., Chicago 5, III., the instruments not only check point alignment to 0.001 inch accuracy over distances from 18 inches to more than 150 feet, but also determine squareness of mirror targets. Since a truly square mirror target returns to the operator an image of the instruments objective end, a target which is out of square will show this image out of center. The built-in illuminator and specially calibrated scale permit the operator to determine exact squareness of the mirror target. Telescopes can be obtained with or without integral optical micrometers (upper view and central view, respectively); and also, with a stride-level (lower view) for obtaining true horizon tal adjustment.

Universal Joint Drilling Head

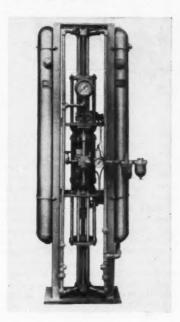
Universal joint drilling head developed by Errington Mechanical Laboratory, Inc., Staten Island 4, N. Y. This tool is adjustable to any pattern of holes and is available with four to twelve spindles. Features include aluminum housing construction, thrust bearings, and gear-driven spindles.





Hydraulic Shear Designed to Cut Steel Strip

Hydraulic guillotine shear driven by a 2-H.P. electric high-pressure pump unit equipped with a three-phase, 220/440 volt, 60-cycle motor. This shear is operated by either a hand or foot valve control, and is equipped with 25 feet of connecting hose. It is said to easily cut through steel strip measuring 4 inches wide by 5/16 inch thick. The shear unit weighs 65 pounds, and the pump unit 400 pounds. Product of Manco Mfg. Co., Bradley, III.



Air-Hydraulic Pumps and Power Units

A series of heavy-duty, air-hydraulic pumps and power units designed to develop high fluid pressure from low air pressure announced by the Ledeen Mfg. Co., 1600 San Pedro St., Los Angeles 15, Calif. This equipment develops fluid pressure directly from the plant air supply, and is suitable for operation of high-pressure cylinders, clamps, valves, actuators, and hydraulic presses; for safety installation and highpressure testing; for special hydraulic circuits requiring variable and adjustable pressure and volume; and for long pressure-holding cycles with quick ap proach without overheating or churning the hydraulic fluid. Both pressure and

volume are readily adjustable. Built as a complete package power unit ready for installation in both horizontal and vertical type construction.

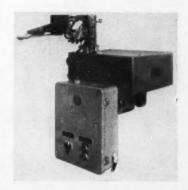


Tool-Holder and Boring Adapters for Lathes

Tool-holder with component boring adapters designed to fit all standard engine and turret lathes. Features to increase production have been incorporated in this equipment just introduced by the Kirkelie Co., 8717 Darby St., Northridge, Calif. Vertical adjustment of tool bits can be made without moving the bits in their holders, and no shims are needed for height adjustment. Accurate duplication of cuts is possible with any number of tool bits or operations. The tool bits can be removed with holder adapter for resharpening without changing the set-up. The tool bars can be removed vertically. eliminating the necessity of moving the carriage back. This reduces wear on the carriage and bed of a lathe.

Punch Press Feeder

An improved version of its mechanical punch press feeder has been developed by the V & O Press Co., Division of Emhart Mfg. Co., Hudson, N. Y. Known as the Feed-O-Matic F-3, the new model broadens the application of the unit in secondary die work and permits its use for parts transfer operations not connected with punch presses. The operator places the part into a nest, where it is picked up by a transfer bracket. Arms and hands are kept out



of the danger zone, a safety factor contributing to higher productivity. The model is designed so that the pick-up can be timed to the completion of a production operation.

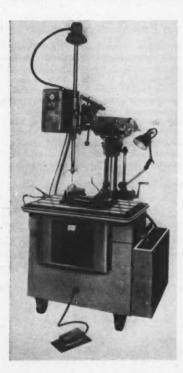


Diamond Tool for Dressing Grinding Wheels

New type diamond wheel dressing tool brought out by the Wheel Trueing Tool Co., 3200 W. Davison Ave., Detroit 6, Mich. This wheel truing device, known as the "Diamond Grit Tool," has been developed especially for use in dressing thread grinding wheels for grinding threads ranging from coarse to fine pitch, It is available in models for thread grinding machines that grind vee or straight-line threads either for production or gage work. The cutting element of the tool is a concentrate of diamond grits in a special alloy matrix.

Elox Electron Drill

An electron drill manufactured by the Elox Corporation, 740 N. Rochester Road, Clawson, Mich., "arc drills" holes



as small as 0.030 inch. The unit has an automatic feed which is adjustable to produce coarse to very fine finishes. So highly sensitive is the automatic feed that if a tiny particle of metal creates a short in drilling, the feed will reverse and the electrode will clear itself instead of welding to the work. This M-300 tool drills or cuts metal of any hardness or thickness. It will cut square, hexagonal, and irregular-shaped cavities as well.

Heliarc Welding Torch

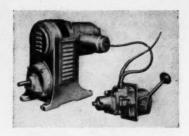
Water-cooled Heliarc torch for inertgas shielded-arc welding made by Linde Air Products Company, a Division of Union Carbide and Carbon Corporation, 30 E. 42nd St., New York 17, N. Y. The torch has a rated capacity for con-



tinuous duty of 300 amperes, and either high-frequency stabilized alternating current or straight polarity direct cur-rent can be used. This new torch, the HW-10, is designed for welding practically all commercial metals up to about 1/8 inch thick. The HW-10 has a torch head and handle assembly weighing only 12 ounces. Cooling water flows directly into the torch body—there is no "outside plumbing." Water is circulated to the torch head, through the water jacket, back through the head again, and out through the power cable. Electrodes can be changed or adjusted in only a few seconds. Collets are available for 0.040-, 1/16-, and 1/8-inch diameter electrodes. Two sizes of torch caps permit the use of either 3- or 7-inch electrodes. The entire torch body is sheathed in tough, long wearing plastic, safeguarding the operator from the danger of receiving an electrical .. ock.

Pneumatic Remote Control for "Varidrive" Motors

Variations in speed of U. S. "Variative" motors by pneumatic remote control are now possible through a recent development of U. S. Electrical Motors, Inc., 200 E. Slauson Ave., Los Angeles 54, Calif. This control consists of an air-operated plunger attached to the speed-changing device and an air valve which remotely controls the plunger. Four types of valves are available de-



pending upon the method desired to operate the mechanism—pedal, lever, cam, or wheel. The device is designed to operate with an air pressure of either 60 or 100 pounds per square inch. By arranging several pneumatic remote controls in a circuit, the speed of the motor can be changed from a number of stations. Conversely, any number of "Varidrives" can be controlled from one station, providing the motors are to operate at the same speed.

Vee Type Packing for Hydraulic Systems

Vee type packing for hydraulic systems offered by Periflex, Inc., Hazel Park, Mich. Identified as "Periflex Set 88," the primary application of the packing is as a rod seal. It is made in rings which are molded of neoprene—a set consisting of any desired number of



rings and male and female end adapters. Individual rings are available for use with machined metal end members. Each ring functions independently and provides a lubricant reservoir. Increased pressures only tend to increase the efficiency of the assembly. Lip interference automatically preloads the packing in the stuffing box, eliminating all but the initial gland adjustment where split rings are specified and used. The rings may also be used as piston seals in cases where the available length permits.

20,000,000 lbs. of steel

TAKES DEPENDABLE PERFORMANCE

Steady, rapid and accurate production is maintained by these five Cincinnati Shears at the Art Steal Company, Inc.

Limits are to .010°, and gauging is both fast and accurate with the easily operated Cincinnati front controlled power back gauge.

Despite the day-in and day-out work schedule, knives are sharpened but once a year.

Investigate these accurate, dependable Cincinnati Shears—you will find them profitable in your shop. Remember, straight-edged square blanks, accurate to size, are produced at low cost on these modern Cincinnati Shears.

Write for Shear Catalog S-6.

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A.

Courtesy the Art Steel Co., Inc., New York, N. Y.

SHAPERS . SHEARS . BRAKES



Heavy-Duty Portable Nibbler

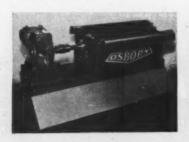
Portable nibbler that will cut through 14-gage stainless steel or equivalent thickness of cold-rolled steel, galvanized iron, and softer materials without distortion on either side of the sheet. This nibbler, called the "Little Wonder," is a product of the Fenway Machine Sales Co., Inc., 20 S. 15th St., Philadelphia 2, Pa. It will also cut holdes in tubes and ducts without damaging in any way the original contour. The nibbler is said to be extremely



accurate, and can be used as a hand tool or easily mounted in a vise for bench operations. It has a minimum cutting radius of 7/8 inch.

Osborn Develops Brush Assembly Units

Concern over the proper handling and use of their industrial brushes has motivated the technical department of the Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland 14, Ohio, to develop a series of assembly units that can be easily integrated into manufacturing or processing operations. One such assembly unit is that designed for cleaning conveyor belts. The brushing unit keeps the conveyor continuously clean, eliminating the need for periodic shutdowns. Material is removed before it hardens or becomes embedded in the belt or litters the area beneath the belt. The unit consists of a 12-inch diameter brush mounted in suitable bearings and coupled to a gear reducer. A channel under the brush permits the material cleaned from the conveyor to be extracted and reclaimed.





Improved Plexiglas Safety Guard for Use on Machine Tools

Improved model safety guard for machine tools and other industrial equipment which obtains versatility from an ingenious arrangement of a sheet of transparent, shatter-resistant Plexialas 1/8 inch thick, and a powerful permanent magnet to which the plastic sheet is swivel-mounted. The magnet holds the patented guard securely in any desired position on a machine base. This "Magnetic Grip-Shield" is made by the Dilley Mfg. Co., 1626 Ansel Road, Cleveland, Ohio. The magnetic Alnico slug is surrounded by a Plexiglas ring to prevent chips from collecting on the magnet. Available in sizes from 6 by 8 to 12 by 16 inches.

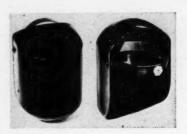
Unit Designed to Pour Accurately Measured Amount of Molten Metal into Mold

The Ajax Engineering Corporation, Trenton, N. J., recently introduced an automatic unit called the "Ajaxomatic," which is designed for pouring accurately measured amounts of molten metal into molds. The normal range is for castings from 1/2 pound to 5 pounds of metal. Castings weighing up to 20 pounds can be produced by making slight modifications in the equipment. The "Ajaxomatic" controls can be linked to the automatic controls on present-day die-casting machines to obtain fully automatic operation during each complete cycle of the die-casting machine.



All-Plastic Welding Helmet

Seamless all-plastic welding helmet announced by the Boyer-Campbell Co., 6540 St. Antoine St., Detroit 2, Mich The shell of this helmet is made from a thermosetting, Fiberglas, reinforced polyester resin by compression molding. It is exceptionally strong and moisture-resistant, will not warp, and is light in weight. Also, it is easily cleaned and sterilized. A complete insulating glass holder, made from shredded canvas base Bakelite, provides strength and lightness. There are four different



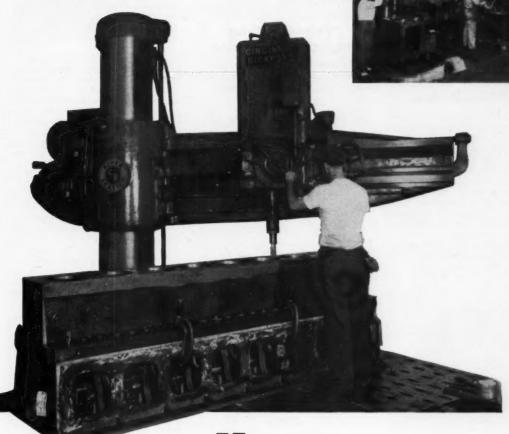
models with plastic, insulated steel, or insulated Dowmetal lift fronts. The filter and cover g'ass on all glass holders is quickly inserted, and held securely in a flexible manner to prevent breakage. Plastic headband is adjustable to suit individual user

Severance Non-Rotating Head Countersink

Micrometer-stop countersink with nonrotating head and positive-lock adjustment now available from Severance Tool Industries, Inc., 636 Iowa St., Saginaw, Mich. Provision for adjustments in increments of 0.001 inch facilitate precision countersinking. The new non-rotating feature of the stop unit is designed to save time and make it unnecessary to hold the stop unit with the free hand to prevent rotation. An improved method of fastening the stop unit to the operating gun results in a shorter over-all length for the tool, reducing overhang to a minimum and making it possible to work in closer quarters. Another feature is the full range adjustment of the cutter from zero to maximum countersinking depth.



This battery of Cincinnati BickfordSuperServiceRadial Drills is drilling, tapping and reaming smaller parts.



"excellent in all respects"...

The ease of handling, the performance, accuracy and speed of the 7' arm, 19" diameter column Cincinnati Bickford Super Service Radial Drills "rated excellent in all respects."

The job involved drilling, tapping, reaming of 43 holes in a large diesel cylinder block.

A battery of smaller Cincinnati Bickford Super Service Radial Drills is also giving "excellent" performance.

Write for descriptive circular of these fine machines.

BICKFORD



RADIAL AND UPRIGHT DRILLING MACHINES

THE CINCINNATI BICKFORD TOOL CO.

Cincinnati 9, Ohio, U.S.A.

MACHINERY, November, 1952-237



Adjustable-Jaw Vise Holds Odd-Shaped Parts

"American Positive Grip Vise" has jaws consisting of two rows of fingers. Marketed by the Connors & Davis Sales Corporation, Circuit Ave., West Springfield, Mass., the vise replaces special work-holding fixtures for many low-production machining operations. The fingers can be pre-set individually to provide an effective grip for an object, regardless of its contour. Once pre-set, the fingers can be opened and closed as a unit to receive duplicate pieces in a lot. Two sizes are available—one has a maximum jaw opening of 3 1/8 inches; the other, 6 1/8 inches.



Geared Speed-Changing Units

Geared drive using herringbone gears throughout, which is available in units designed to provide definite ratios of speed reduction, speed increase, or a combination of both. Made in two-, three- and four-speed combinations, in a wide range of ratios and horse-power capacities by the Philadelphia Gear Works, Inc., Erie Ave. and G St., Philadelphia 34, Pa.

"Point-Chek" for Inspecting Drill Points

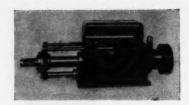
"Point-Chek" gage for optically precise inspecting of drill points. With this simple hand tool, new and resharpened



drills can be quickly inspected to make certain that the lips have been ground to equal angles and lengths so that holes of accurate size—as well as more holes per drill—can be produced. The error in angles is determined accurately by a micrometer barrel graduated in degrees: Made by the F. T. Griswold Mfg. Co., Devon, Pa.

Self-Contained Drilling Unit

Small self-contained drill unit which can be mounted on a machine in any position to provide for extra drilling and boring jobs. The spindle is direct-driven by an electric motor with push-button control. The rapid traverse rate is over 400 inches per minute, and feeding rates up to 30 inches per minute are available. The drilling capacity is 1/2 inch in steel. Speeds can be varied by



changing sheaves and belts. Multiple heads can be mounted on flange of quill. This compact unit weighs only 175 pounds, and is especially adapted for use on transfer machines. It is made with a 9-inch stroke on mounting base 13 3/8 inches long, and with a 12-inch stroke on base 16 3/8 inches long. Product of Drillunit, Inc., 637 Mt. Elliott, Detroit 7, Mich.

Hydraulic Jack

Hydraulic jack of 50-ton capacity recently introduced by the Hein-Werner Corporation, Waukesha, Wis. This jack is equipped with positioning handles. It is adapted for straightening and leveling operations, heavy-duty compressing, moving heavy equipment, and similar jobs where a powerful force is needed.



The positioning handles facilitate carrying and "spotting" the jack. A tandem pump serves to speed up jacking and eliminate operator fatigue. The base of the jack is drilled to facilitate installation of a pressure gage.

Diamond Dust Reclaimed from Grinding Sludge

The Timken Roller Bearing Co., Canton, Oh'o, recently ad pted the practice of salvaging diamond dust from grinding sludge. In the first operation, 1175 carats of diamonds were reclaimed from about *00 pounds of sludge. In a second operation, over 435 carats of diamonds we erecovered from approximately 200 pounds of sludge. The cost of the salvaging process has amounted to about \$2 per carat. Along with the diamonds, 46 pounds of tungsten were recovered.

Newly Elected Officers of American Welding Society

At the Thirty-third Annual Meeting of the American Welding Society, held in Philadelphia, Pa., during the week of October 19, the following officers for the year 1952-1953 were elected: President, Fred L. Plummer, director of engineering, Hammond Iron Works, Warren, Pa.; first vice-president, Eric R. Seabloom, supervisor of field engineering, Crane Co., Chicago, Ill.; and second vice-president, J. H. Humberstone, vice-president of the Air Reduction Co., Inc., New York City.

Hack Saw Association Adopts New Standards

The Hack Saw Manufacturers Association of America, Inc., has adopted a Revised Standard Schedule of Sizes for Hack Saw Blades after approval by all American and Canadian manufacturers. One of the important changes in the revised schedule is a decrease of about 10 per cent in the number of standard specifications. As a result of more than two years of study and testing, it was determined that for blades up to 24 inches in length the width should be twenty times the thickness.

GROUND OR ACCURATE UNGROUND

Inter-Departmental Memorandum

From: Factory Superintendent

To: Purchasing Subject: Lower Hobbing Costs

Better check with Michigan Tool or their representative in our area. They have a new process for making even more accurate unground hobs.

We might be able to cut hobbing costs on some of our jobs With these. Ask them for their Bulletin H-52. It shows their tolerances for both the ground and newest accurate unground types.

MICHIGAN TOOL



To produce eight single lugs on the end of a steel sleeve was a problem recently given to Detroit Broach.

After analysis of the operation, Detroit Broach recommended a single ram vertical surface broach to do the job. One of the problems within the job, in addition to increasing output, was the necessity of holding a close tolerance between the lugs.

The vertical broaching machine was set up with a two-station fixture which powerclamps the parts. A single pass of the broach forms four lugs across the sleeve. The sleeve is then indexed 90° and the other four lugs are formed. Complete cycle time—33 seconds or completed part. Slot tolerances are easily held and surface finish on the lugs requires a additional machining.

"he is just typical of the specialized broaching techniques evolved by Detroit Broach for its ting manufacturers. You, too, may have an application that can be materially reduced in time or cost by the economy of broaching or by review of present broach teoling. It will pay you consult Detroit Broach for engineering or production data.

WORLD'S LARGEST MANUFACTURER OF BROACHES AND BROACHING TOOLS EXCLUSIVELY



DETROIT BROACH COMPANY

DETROIT 34, MICH.

PRODUCT INFORMATION SERVICE

Use the postage-free postcard below for further information on New Catalogues described in the November, 1952, issue of MACHINERY. Circle key number of item in which you are interested and print name and address on postcard.

NEW CATALOGUES

SHEET-METAL WEIGHT CALCULATOR—Dayton Rogers Mfg. Co., Minneapolis 7, Minn. Improved slide-rule calculator for rapidly determining the weight of all flat sheet material. Can be obtained free of charge by making request on a company letter-head, addressed directly to the Dayton Rogers Mfg. Co.

BROACHING — Lapointe Machine Tool Co., Hudson, Mass. Booklet commemorating the Golden Anniversory of broaching, entitled "Life was like that . . Before Broaching."
The first part of the booklet is devoted to a description of early broaching practice, and the latter part to the remodeled Lapointe plant and its modern broaching facilities, 1

BAKELITE AND VINYLITE PLASTICS AND RESINS—Bakelite Co., a Division of Union Carbide and Carbon Corporation, New York City. Booklet G-19, entitled "Condensed Reference File of Bakelite and Vinylite Plastics and Resins," containing 110 photographs of applications and finished products, as well as short descriptions of the wide range of these plastics.

LATHES, SHAPERS, AND DRILL PRESSES— South Bend Lathe Works, South Bend, Ind. General Catalogue 5205, containing eighty-eight pages which give complete descriptions and specifications of the entire South Bend line lathes, shapers, and drill presses, as well as attachments, chucks, tools, and accessories. 3

MACHINE TOOLS—Cincinnati Milling Machine
Co., Cincinnati 9, Ohio. 1953 General Catalogue M-1776, describing and illustrating in
fifty-one pages Cincinnati milling, grinding,
broaching, die-sinking, and cutter sharpening
machines. Also included is information on
hydroform machines and precision grinding
wheels.

X-RAY INSTRUMENTS — North American Philips Co., Inc., Research and Control Instruments Division, Mount Vernon, N. Y. Booklet entitled "Facts and Figures on Three Powerful X-Ray Tools far Non-Destructive Analysis," describing the three instruments—fill diffraction, spectrometer, and spectrograph. 5

BROADENING WORKERS' SKILLS—U. S. Department of Labor, Washington 25, D. C. Booklet entitled "Your Skill Improvement Program," emphasizing the importance of developing training programs to meet specific needs. It sets forth ideas and suggestions for the organization and operation of such programs.

MULTI-MILLERS—U. S. Tool Co., Inc., Ampere (East Orange), N. J. Builetin 25, illustrating and describing U. S. Multi-Millers-semi-automatic production type milling machines suitable for the performance of many different types of milling operations on small and medium-sized parts.

FLEXIBLE METAL HOSE AND TUBING—American Brass Co., Waterbury 20, Conn. Catalogue CC-400, describing American flexible metal hose and tubing made in two basic types: seamless and strip wound. The range of available alloys and sizes and suggested applications are given.

WIRE CLOTH AND FILTER CLOTH — Multi-Metal Wire Cloth Co., Inc., New York City. Catalogue 50, consisting of a 125-page handbook of technical data on wire cloth, filter cloth, and fabricated products. Included is a research report on the flow characteristics and particle retentivity of metallic filter cloth, as well as pertinent information required in designing filters, strainers, washers, etc. 9

SINGLE-SPINDLE DISC GRINDERS — Gardner Machine Co., Beloit, Wis. Catalogue 5-52, illustrating and describing the full Gardner line of single-spindle disc grinders for flat surface grinding aperations. Catalogue is available to interested production officials. 10

CUTTING TOOLS — Gairing Tool Co., Detroit, Mich. Catalogue describing Gairing standard tools, including interchangeoble counterbores, back spot-facers, core drills, black type boring tools, and milling cutters. A price list accompanies the catalogue.

PRODUCTION UNITS—Barnes Drill Co., Rockford, III. Bulletin 150-C, showing Barnesdril production units and their applications for multiple or sequence drilling, reaming, facing, bering, tapping, and other operations. 13

IMPACT HAMMER — Black & Webster, Inc., Newton, Mass. Data sheet folder explaining the operating features of the improved Electro-Punch, an impact hammer suitable for many "joining" operations of small-product assembly

CONTROLS — Simmonds Aerocesseries, Inc., Tarrytown, N. Y. Manual giving engineering data on push-pull control systems—construcCOUNTERSINK CUTTERS—Severance Teal Industries, Inc., Saginaw, Mich. Bulletin 20-JB 25-6, describing the Severance micrometer stop-countersink cutter with non-rotating head and positive-lock adjustment.

GRINDING WHEELS—Simonds Abrasive Co., Philadelphia, Pa. Catalogue ESA-29, describing Simonds grinding wheels for internal grinding operations. Internal grinding wheel recommendations and tables of standard sizes and shapes up to 2 1/2 inches in diameter are presented.

LUBRICATION—Trabon Engineering Corporation, Cleveland, Ohio. Bulletin 329, entitled "Here's What Trabon Centralized Lubrication Systems Can Do for You," descriptive of the Type M (manifold) and reversible oil and grease systems.

TESTING MACHINES—Baldwin-Lima-Hamilton Corporation, Philadelphia, Pa. Bulletin 4202, presenting the Model FGT Baldwin-Emery SR-4 testing machine of 50,000 pounds copacity for static, dynamic, and impact testing. 22

ENGINEERING SERVICE—Lombard Corporation, Oak Park, Ill. Booklet explaining Lombard engineering facilities for the design and construction of heavy machinery for the metals industry. Examples of typical operations are





BUSINESS REPLY CARD FIRST CLASS PERMIT NO. 58, 880. 54.5, P. L. 48., MBW YORK, M.Y.

MACHINERY

148 LAFAYETTE STREET

NEW YORK 13, N. Y.

READERS' SERVICE DEPT.

WELDING SCHOOL—Lincoln Electric Co., Cleveland, Ohio. Bulletin 416-5M, entitled "Building Your Career in Arc Welding," descriptive of the Lincoln School of Welding, the various courses given, and the school's facilities. 24

ELECTRIC OVENS AND FURNACES — Cooley Electric Mfg. Corporation, Indianapolis, Ind. Catalogue covering the company's general-purpose and high-speed electric furnaces, recirculating furnaces, electric ovens, etc. 25

MAGNETIC ALLOYS — Westinghouse Electric Corporation, Pittsburgh, Pa. Booklet TD-52-100, describing Westinghouse magnetic alloys, and giving physical and magnetic property tables together with the evailability of each alloy described.

COUPLING BORING MACHINES — William K. Stamets Co., Pittsburgh, Pa. Bulletin 100-B, describing Stamets coupling boring machines which simultaneously bare and face pipe couplings and similar taper and straight bared work.

LINING AND COVERING MATERIAL — U. S. Stonewere Co., New York City. Bulletin TL-526,

on Tygon corresion-resistant linings. Composition, physical forms and properties, and where and how to apply Tygon are discussed. 31

DRILL PRESSES—Boice-Crans Co., Toledo, Chio.
Catalogue describing the company's drill presses,
including high- and slow-speed bench and floor
models in one, two, three, and four spindle
combinations.

T-LATHE — Lodge & Shipley Co., Cincinnati, Ohio. Bulletin 25, on the 30-inch T-Matic lathe for fast automatic duplication of short, thinwalled section work of large diameter. 37

RIGID-TEX METAL—Rigidized Metals Corporation, Buffalo, N. Y. Folder explaining how this "three-dimensional" metal can be fabricated the same as plain flat-rolled metal. .. 38

DIESEL ENGINES — Nordberg Mfg. Co., Milwaukee, Wis. Bulletins 208-219, consisting of specification sheets on Nordberg 4FS onetwo-, and three-cylinder Diesel engines. 43 PURCHASING BLISS PRESSES—E. W. Bliss Co., Canton, Ohio. Leafiet on the deferred payment plan for purchasing Bliss presses, presenting a table to serve as a reference guide. 44

PACKAGING STEEL AND ALUMINUM—Berlin & Jones Co., Inc., New York City. Leaflet on a packaging to give ferrous metals and aluminum alloys protection from rust and corrosion.

FLUID POWER CIRCUITS — Logansport Machine Co., Inc., Logansport, Ind., Manual entitled "The Circuit Rider," consisting of a discussion of basic designs in fluid power circuits.

POWER TRANSMISSION EQUIPMENT—Reliance Electric & Engineering Co., Cleveland, Ohia. Builletin A-2703, describing the company's products—motors, drives, and generators. 47

MILLING MACHINES—Onerud Machine Works, Inc., Chicago, III. Bulletin 1139, describing Onerud high-speed milling machines for milling aluminum and related non-ferrous metal alloys.

INDUSTRIAL HOSE—J. N. Fauver Co., Inc., Detroit, Mich. Catalogue 52, covering the Fauver line of industrial hose assemblies, couplings, stems, swivels, and accessories. 49

RECTIFIER STACKS — General Electric Co., Schenectady, N. Y. Catalogue GEA-5699-A, describing the basic characteristics and applications of copper-oxide rectifier stacks. 30

COPYING MACHINES — Charles Bruning Co., inc., Teterboro, N. J. Booklet A-2042, on the Model 14 Copyflex machine suitable for office use, in which the Copyflex process is explained.

ROLLER BEARINGS—Berliss Bearing Co., Belleville, N. J. Cataogue 522, presenting a description of Berliss roller bearings and assemblies, together with bearing selection data. 53

AIR CYLINDERS — Lindberg Engineering Co., Chicago, Ill. Builetin 731, containing information on the capacity, type of mounting, etc., of Lindberg air cylinders.

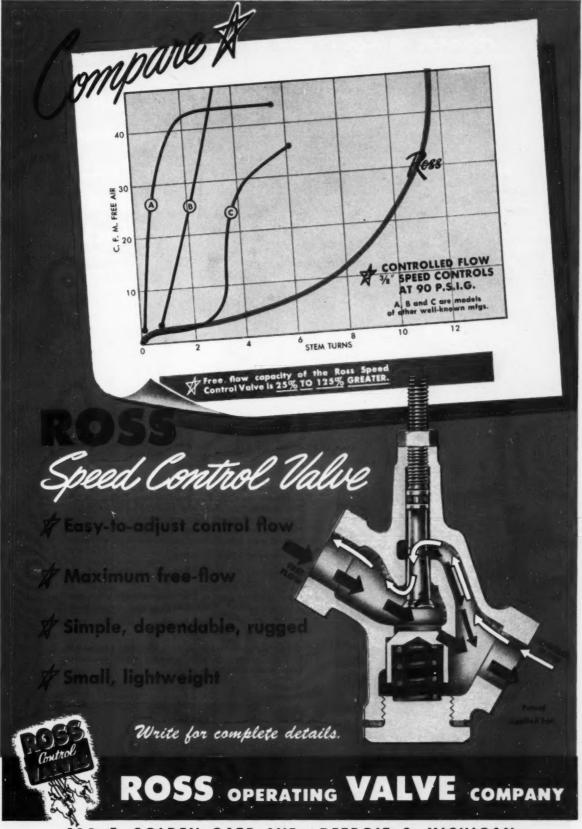
AIR CYLINDERS—Miller Motor Co., Melrose Park, III. Bulletin A-105G presenting engineering, design, construction, and mounting data on Miller air cylinders.

VOLTAGE STABILIZERS—General Electric Co., Schenectady, N. Y. Booklef GEA-5754, giving explicit information for applying the G-E automatic voltage stabilizer.

Product Information Service

Use the postage-free postaged below for requesting further information on New Catalogues. Simply circle the numbers of the Items in which you are interested. Please print your name and address.

					-									
11	9	20	30	9	20	9	1	1/52						
Circle by	•	19	29	36	49	59	1	M-1						
0	80		28	38	48	58	1						tate	1953
fundham.	-	11	27	37	47		1							L August
INFORMAT you wish fo	9	91			46	26		RINT					Zone	r February
Z ž	10		25		45		65	ASE I						d offe
MORE	*	1	24		7		64	25				1.4		le void
5 :	•	13	23	33	43	53	63							le cord
PLEASE SEND from numbers	2	12	22	32	42	52	62			000000000000000000000000000000000000000				111
31	-	=	21	3	=	10	-9		į	Title	Firm	Street	ā	



120 E. GOLDEN GATE AVE., DETROIT 3, MICHIGAN

Another Transfer-matic by Cross

188
Operations
On Tractor
Cylinder
Block

- * Mills distributor boss; drills, bores and spotfaces distributor hole; drills, chamfers and reams tappet holes; drills crankshaft and miscellaneous oil holes; drills and reams oil filler and dipstick holes; drills, chamfers and taps cylinder head, distributor mounting, oil pan and bearing cap holes; taps oil holes.
- * 72 pieces at 100% efficiency.
- * 22 stations—one for loading, 15 for machining, six
- * Cross Machine Control Unit automatically stops machine when tools need changing and pre-set tools reduce down-time.
- * Gravity operated cam clamping.
- * Other features: Hydraulic and electrical equipment to J.I.C. standards with stranded wire; hydraulic feed; automatic lubrication.

Established 1898

TH

CC

Special MACHINE TOOLS



Low-Down on Luigi

Luigi was the "hydraulic man" introduced to mechanical society by Rivett Lathe & Grinder, Inc., at the last Tool Engineering Show. Here is a description of the monster: He moved his arms, legs, and feet, stood up and sat down. His eyes were gages, his nose a switch. His stomach was transparent in order to view valve operations. Hydraulic cylinders activated his knees, hips, shoulders, arms, and back.

The Case of the Coveted Book

In a letter from Sao Paulo, Brazil, Milton Ludviger of Carrosserios Continental, S. A., informs us: "Sirs, a very valuable book has been stolen from my reference file—MACHINERY'S HANDBOOK. Notify me about all expense you will have sending this book to Brazil. Working only with American machinery and material, I need this book as much as my eyes and I hope

you will understand my demand. Be sure you have a sincere friend down here in Brazil."

The Diligent Dillons

W. C. Dillon & Co., Inc., consists of a father and six sons—who work as a team inventing and producing precision test apparatus in Van Nuys, Calif. Dad Dillon just patented a carrier telephone system that permits as many as twenty-six different conversations on a single pair of wires, all at the same instant—probably the result of trying to confer by telephone with the whole family at one time.

Fabwodi Pays Off

FABWODI is the slogan of Illinois Central employes. It means "Find a better way of doing it," and was coined to stimulate participation in the railroad's suggestion system, Wheels tells us. So far, 12,385 workers have earned \$774,665 for their ideas.

All-Girl Cast

Five glamorous models decked out as "Indian" maidens in short dresses with fringe and beads—perhaps not exactly where Minnehaha wore her fringe and beads—posed as a background at the Sivyer Steel Casting Co.'s booth during the recent National Chemical Exposition. In their dainty hands they clutched stainless steel castings, about which visitors who stopped at the booth presumably asked.

Model Students

A working model of a Bessemer converter won two high school boys (Thomas J. Nara and Ronald Gramm) in Pittsburgh the Rust Engineering Co.'s award. The model was constructed of balsa wood with a milk and salt water solution to represent the molten steel. When poured, the solution acting as a conductor switch turned on red lights in the mixer, converter, and ladle, giving it a real molten appearance.

CONTRIBUTOR FROM CALIFORNIA—Gilbert C. Close, located in the heart of the aircraft industry, periodically sends MACHINERY articles of interest. Mr. Close was born in Waterloo, lewa, and was an engineer graduate at the University of Minnesota in 1932. For six years he was in a construction business in Huron, S. D., then decided to devote himself to technical journalism. Shortly after the authreak of World War II, he joined the process engineering department of the Douglas Aircraft Co., Santa Monica, Calif., where later he was placed in charge of technical publications. Left Douglas in 1945 to



write technical orders covering airplane maintenance and overhaul for the United States Navy. After this, he returned to full-time technical journalism. To date Mr. Close estimates that he has had about 1200 technical articles published in more than eighty magazines. As to hobbies, he has published numerous short stories; some of them for young boys have been republished in book form. Then he is a photographer—to the extent of having pictures accepted in salon editions of camera and art magazines. With two lively teen-age daughters, Mr. Close is never at a loss for photographic fodder.

MOUSTRY.

California

CHARLES W. BAKER has been appointed western regional manager with headquarters in Los Angeles, Calif., for the Chase Brass & Copper Co., Waterbury, Conn., subsidiary of the Kennecott Copper Corporation. Mr. Baker was formerly Milwaukee, Wis., district manager, and the position he has vacated will be filled by CHARLES A. FESTGE.

H. KRAMER & Co., Chicago, Ill., brass and bronze ingot producer, has opened its California Division plant at 631 S. Aviation Blvd., El Segundo, Calif. ALVIN A. MEYROWITZ, vice-president and general manager of the company, will direct the Division.

PRESSED STEEL CAB Co., INC., Chicago, Ill., has purchased the entire business of the Axelson Mfg. Co., Los Angeles, Calif. The latter company will continue to operate as the Axelson Mfg. Co., Division of Pressed Steel Car Co., Inc.

JAMES KING HOYT has been appointed assistant western manager of A. Milne & Co., Pittsburgh, Pa., distributor of solid and hollow tool steels. Mr. Hoyt will make his headquarters at the San Francisco, Calif., office.

LINDBERG ENGINEERING Co., Chicago. Ill., is building a plant in Los Angeles, Calif., for the production of industrial heat-treating and melting furnaces.

W. C. DILLON & Co., Inc., manufacturers of precision testing apparatus, have recently moved to a new plant located at 14620 Keswick St., Van Nuys, Calif.

Illinois

WHEELCO INSTRUMENTS DIVISION, BARBER-COLMAN Co., Rockford, Ill., has announced the following changes in personnel: Richard K. Hungerford becomes district manager at Baltimore, Md., transferring from New York City; Gordon Hubbert, formerly at Chicago, Ill., is now district manager in Detroit, Mich.; while Howard P. Berger has been transferred from Baltimore to Cleveland, Ohio, and Harold F. Dahlke from Chicago to New York City. Also announced was the establishment of three district offices: at 900 Monroe,

N.W., Grand Rapids 2, Mich., with ROBERT P. CAMPBELL as district manager; at 307 E. 4th St., Cincinnati 2, Ohio, with Edmund C. McFaul as district manager; and at 432 E. Pike St., Clarksburg, W. Va., with Earl J. Kelly as district manager. A suboffice under Clarksburg is located at 945 Somerset Drive, Charleston, W. Va., with J. McKeown in charge.

WILLIAM O. SPRINGER, Cleveland, Ohio, plant manager, was recently appointed manager of the New York City plant of Joseph T. Ryerson & Son, Inc., Chicago, Ill., steel distributors. Mr. Springer replaces JAMES M. MEAD, who is assuming special administrative duties with the company in Chicago. The post vacated by Mr. Springer will be filled by JOHN W. QUEEN, formerly alloy steel division manager at Chicago.

George Seeburg, formerly sales engineer, has been promoted to the position of assistant general manager of the Sundstrand Machine Tool Co., Rockford, Ill. T. B. Buell, who was sales manager for the company, has become general sales manager in charge of over-all sales policies, while Harry Leber is to succeed Mr. Buell as sales manager. He was formerly manager of direct sales.

HOWARD E. EARI. recently became associated with the Sundstrand Machine Tool Co., Rockford, Ill., in the



Howard E. Earl, who is joining the Sundstrand Machine Tool Co. as chief engineer

capacity of chief engineer in charge of an engineering department for the development of the company's pneumatic and magnetic products. Mr. Earl was formerly director of research for the Eureka Williams Corporation.

NEFF, KOHLBUSCH, & BISSELL, Chicago, Ill., has been appointed selling agent for the Frauenthal high-precision grinders manufactured by the Frauenthal Division of the Kaydon Engineering Corporation, Muskegon, Mich. The agent will handle sales in Iowa, Wisconsia, northern Illinois, and northern Indiana.

HARRY R. SANOW was recently named general superintendent of the Riverdale Works, Riverdale, Ill., of the Acme Steel Co., Chicago, Ill. Mr. Sanow joined the company thirty years ago, and at the time of his promotion was director of manufacturning divisions, a post he has held since 1950.

JAMES M. MEAD, formerly manager of the New York City plant of Joseph T. Ryerson & Son, Inc., Chicago, Ill., has been appointed first assistant to the vice-president in charge of purchasing, procurement, and merchandising. His headquarters will be in Chicago.

CLAUD S. GORDON Co., Chicago, Ill., announces the opening of its new plant at Richmond, Ill., for the manufacture of thermocouples, pyrometer accessories, specialty instruments, and metallurgical testing machines.

DENISON ENGINEERING Co., Columbus, Ohio, manufacturer of oil hydraulic equipment, is opening an office at 4306 W. 63rd St., Chicago 29, Ill. as central region headquarters, with Melvin G. Sulser as manager.

Indiana, Tennessee, and Kentucky

D. J. Jones has become general sales manager of the Honan-Crane Corporation, Lebanon, Ind., manufacturer of oil and coolant filters, clariflers, etc.

RAYMOND DEARTH has joined the Udylite Corporation, Detroit, Mich., as sales engineer for the northern Indiana area.



MORE THAN 300 PARTS ARE MACHINED with the aid of one cutting oil for tools and hardware items made by Sargent & Co. Raw materials worked are: B1113 steel, 11ST-3 aluminum, ASTM-B140-46 Type B half-hard bronze, B16-46 brass, and Type 416 stainless steel. Stock ranges from 1/6" wire to 2" bars.

SINGLE GRADE OF SUNICUT REPLACES 4 CUTTING OILS

A good example of cutting-oil economy and efficiency is provided by Sargent & Co., well-known hardware and tool manufacturers. Their complete line requires the machining of more than 300 parts from a wide range of metals. A few years ago this company was using four different cutting oils, purchased in drums. By switching to a single product, Sunicut 11W, and buying it in bulk, Sargent has been able to effect an annual saving of about \$3,000. All operations are performed as well as before, or better—and shop efficiency is up.

Sunicut 11W is a low-viscosity, dual-purpose cutting oil for automatics machining all nonferrous metals and free-machining steels such as B1112 or B1113. Its transparency permits quick and accurate miking. It will not stain brass or copper under normal conditions. It drains rapidly, minimizing carry-off. And its high lubricating and cooling properties aid in prolonging tool life and improving finishes. Moreover, it protects finished parts from rust and corrosion.

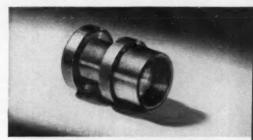
Other Sun cutting oils offer similar opportunities for improved operations and economy. For information about them, or the help of a Sun representative, use the coupon at the right.

SUN INDUSTRIAL PRODUCTS
SUN OIL COMPANY, PHILADELPRIA 3, PA. - SUN OIL COMPANY, LTD., TORONTO 4 MONTREAL





• Machine: model 601 New Britain Gridley
• Operations: cross slide—rough form, finish form, break down cut off, side mill, vertical end mill, final cut off; tool slide—face, drill offset hole, ream and counterbore offset hole, thread
• Spindle Speed: 1,324 rpm • Feed: .006" per revolution • Tools: high-speed steel • Cycle Time: 7.3 seconds



CARPENTER'S PLANE PART. Metal: %"
B1113 steel • Machine: Brown & Sharp Automatic Screw Machine • Operations: front cross slide—form; rear cross slide—cut off; turret—feed stock, spot drill, drill "\(^{13}\)\" hole, tap drill, reverse spindle and tap left-hand thread • Spindle Speed: 1,180 rpm • Feed: .0025" per revolution • Tools: high-speed steel • Cycle Time: 30 seconds



KNOB INSERT. Metal: 1½° round aluminum
• Machine: model 61 ½° New Britain Gridley
• Operations: cross slide—form, knurl, cut off;
tool slide—spot drill, tap, ream, recess • Spindle
Speed: 1,600 rpm • Feed: .005° per revolution
• Tools: high-speed steel • Cycle Time: 7 seconds

SUN	OIL	co	MPANY,	Dept.	M-11.
Philad					

I am having trouble possibly caused by an
inadequate cutting oil. I would like the serv-
ices of a Sun representative; I the booklet
"Cutting and Grinding Facts."

Name		
Title		
Company		
Street		
City	7one	State

ARTHUR H. BEASLEY has been made manager of the Memphis, Tenn., sales branch of the Wagner Electric Corporation, St. Louis, Mo. He succeeds A. Callaway Allen, who recently became sales manager of the Electrical Division.

JOHN HELLSTROM, vice-president of American Air Filter Co., Inc., Louisville, Ky., has been appointed director of sales of all AAF and Herman



John Hellstrom, newly appointed director of sales of the American Air Filter Co., Inc.

Nelson products. Prior to this, Mr. Hellstrom was manager of the company's Pacific Division. Also announced was the removal of the sales and advertising departments of the Herman Nelson Division, Moline, Ill., to Louisville. Assisti... Mr. Hellstrom will be Robert W. Nelson, vice-president, formerly of that division.

Maryland, West Virginia, and Georgia

ALAN B. CASTATOR has been named general sales manager of the brush division factories at Baltimore, Md., and Keene, N. H., of the Pittsburgh Plate Glass Co., Pittsburgh, Pa. His headquarters will be at Baltimore. Mr. Castator has been assistant manager at the Detroit, Mich., warehouse for the past five years.

E. E. McAllister has been appointed salesman in the Princeton, W. Va., territory for the Mining Division of Firth Sterling Inc., Pittsburgh, Pa.

ARTHUR COLTON Co., Detroit, Mich., announces the appointment of the WAREEN CURRY Co., Atlanta, Ga., as representative for the complete line of Colton products.

Michigan

Macklin Co., Jackson, Mich., recently announced the incorporation of two wholly-owned subsidiaries of the company: Macklin Sales Co., to handle all sales of grinding wheels and other abrasive products manufactured by the Macklin Co.; and the Macklin Abrasive Co., to manufacture and sell the abrasives.

DR. SAMUEL S. KISTLER has been appointed research associate by the Peninsular Grinding Wheel Co., Detroit, Mich., abrasive manufacturer. Dr. Kistler resigned recently as director of research for the Norton Co., Worcester, Mass.

NORTON C. MARSHALL announces the purchase of stock and equipment of the Engineering Research & Mfg. Co., Detroit, Mich., designer and processor of aircraft and automotive special tools, dies, gages, jigs, and fixtures.

JOHN K. RYE, assistant general manager of the F. Jos. Lamb Co., Detroit, Mich., builder of special machine tools and dies, has been promoted to the position of general manager.

HOWARD E. CRAWFORD, assistant general sales manager, has been promoted to the post of general sales manager of the Pontiac Motor Division of General Motors Corporation, Pontiac, Mich.

BRUCE M. REGAN, general superintendent of plants for the Snyder Tool & Engineering Co., Detroit, Mich., and its subsidiary, the Arthur Colton Co., now becomes manufacturing manager of all Snyder and Colton plants. Mr. Regan joined the Snyder



Bruce M. Regan, manufacturing manager of Snyder Tool & Engineering Co., and its subsidiary, Arthur Colton Co.

organization in 1928 as a toolmaker, specializing in building machinery. George Derwich, assistant general superintendent, is assuming the responsibilities of plant superintendent of plants Nos. 1 and 2. ROBERT J. MAXVILL succeeds Mr. Derwich as assistant plant superintendent.

ALLIED PRODUCTS CORPORATION, Detroit, Mich., announces that the addition to its precision parts plant in



Leland E. Coulter, who is assuming a new executive position at Allied Products Corporation

Hillsdale, Mich., has been completed. Leland E. Coulter has been named general manager of R-B interchangeable punch and die activities, while Peter C. Fortune is being transferred from Chicago to assist Mr. Coulter. William Reece has been appointed to head sales in the Chicago territory. Raymond E. Wilds has been named assistant sales manager of R-B products.

SAM R. READ is joining the Visi-Trol Engineering Co., Detroit, Mich., in the capacity of staff engineer.

New England

NORTON Co., Worcester, Mass., has announced the following promotions: GEORGE H. POWERS, refractories engineer with headquarters in New York City, replacing FRED E. LEEBY, who recently retired after twenty-nine years of service with the company; and LINCOLN M. JOHNSON, honing engineer, to cooperate with the Micromatic Hone Corporation, Detroit, Mich., with headquarters at Norton's Detroit office.

Beresford N. Clarke has been appointed sales engineer in the New England territory for the Surface Combustion Corporation, Toledo.

SIDNEY HEAVY-DUTY LATHES

BUILT FOR LONGER LIFE

Here is a 32-inch Model 16 Sidney Lathe turning columns for 3 and 4-foot sensitive radial drills. Carboloy tools are being used on semisteel. Speed: 300 feet per min. Photograph taken in plant of Fosdick Machine Tool Co., Cincinnati, Ohio.



FOSDICK RADIAL DRILL

Write for bulletins . . . or contact nearest Sidney representative

THE SIDNEY MACHINE TOOL CO. . SIDNEY, OHIO

Builders of Precision Machinery since 1904

MADE TO STARRETT STANDARDS OF ACCURACY AND PERFORMANCE

DIAL

INDICATORS



STARRETT DIAL COMPARATOR
No. 653
With fine vertical adjustment. Base
platen 9" x 9%". Vertical capacit

With fine vertical adjustment. Base platen 9" x 9%". Vertical capacity 9%". Throat depth 5". Indicator graduated .001".

GAGES
Made in a complete range of standard Asizes and 54 types with F

STARRETT

DIAL

plete range of standard A.G.D. sizes and 54 types, with English or Metric graduations.



No. 1015-B

STARRETT PORTABLE DIAL HAND GAGES No. 1015-A and 1015-B

1/2" and 1" thickness capacities; 21/2" throat. Ideal for quickly measuring plywood, rub-

ber, textiles, paper, metal parts, leather, veneer, fabrics, etc.



No. o

STARRETT UNIVERAL DIAL BENCH GAGE No. 652

With sliding table and fine adjustment. Capacity 1¾", throat depth 1¾". Indicator graduated .0005".





WRITE FOR YOUR COPIES

DIAL INDICATOR CATALOG describes and illustrates the complete line with specifications and useful data...Address Department D. TRANSFER and DIMENSION CHARTS. Full scale details for quick tracing plus complete dimensions of all indicators and contact points.



Starrett

SINCE 1880 WORLD'S GREATEST TOOLMAKERS



Athol, Massachusetts, U. S. A.

MECHANICS' HAND MEASURING TOOLS AND PRECISION INSTRUMENTS DIAL INDICATORS • STEEL TAPES • PRECISION GROUND FLAT STOCK HACKSAWS, BAND SAWS and BAND KNIVES



Dependable service Quality products

MACHINERY'S DATA SHEETS 717 and 718

OF ENGINE	
OF	
N STANDARD FOR ACCURACY	LATHES_3
FOR	00W
NDARD	TOOL-ROON
STA	ND
AMERICAN	•

0

0

0

	Test		PARTICION SPINGLE ALIGNMENT — VESTICAL		TALSTOCA TAPER ALKHARENT - HORIZONTAL	VERTICAL ALCOHOLDS OF	fronting for less certifies fronting for less to the form of the
	Tool Room	Lathes	High at End of Spindle When Pully Extended 0 to 0.0005	Mad of 12 In. Test Mar 0 to =0.0005	High at Bud of 12 In. Test Ber 0 to 0,00005	High at Tailstock 0 to 0.002	Persite With Ways O to 0.009 Herizontal O to 0.004 Vertical Alignment Alignment Herizontal Herizontal
Recommend		12 In. to 18 In., Incl.	High at End of Spindle When Fully Extended 6 to 0.0008	End of 112 lis. Test Bar 0 to = 0.0008	High at End of 12 In. Yest Bar 6 to 0.0008	High at Tailsteek 0 to 0.003	Peralled With Ways 0 to 0.004 Illorizontal 0 to 0.004 Vertical Alignment of India Nuc
Recommended Standards	Engine Lathes	20 In. to 32 In., Incl.	High at End of Spindle When Pully Extended 0 to 0.0015	End of 12 In. Test Bar 0 to ~0.0015	High et Bad of 12 In Test Bar 0 to 0.0015	High at Talistock 0 to 6.004	Parallel With Ways to to 0.000 Berizontal 0 to 0.000 Verital Alignment ed Half Nat Horizontal 0 to 0.000
		40 In. to 72 In., Incl.	High at End of Spindle When Fully Extended 0 to 0.0015	End of 12 In. Test Bar 0 to =0.0015	High at End of 12 In. Tent Sar 0 to 0.0015	High at Talistock 0 to 0.003	Parallel With Waye to to 0.006 Horizontal 0 to 0.009 Vertical Alignment of Ball Net Eorizontal 0 to 0.009

MACHINERY'S Data Sheet No. 717, November, 1952

Approved by American Standards Association as B5.16—1952

AMERICAN STANDARD FOR ACCURACY OF ENGINE AND TOOL-ROOM LATHES—4

		40 In. to 72 In., Incl.	Meximum 0.00075	To Face Hollow or Concave Only on 12 In. Diameter 0 to 0.001	On Diameter On O.0015 on Face at Rominal Diameter 0 to 0.002	Face and Periphery 0.005 Face of Steps 0.005 Bar Test 3 In. From End of 1 av. Bar Danneter Same as Hole	No Callets Used on These Lethes
Standards	Engine Lathes	20 In. to 32 In., Incl.	Maximum 0.0005	To Face Hollow or Concave Only on 12 In. Diameter 0 to 0.001	On Diameter 0 to 0.0015 on Face at Nominal Diameter 0 to 0.002	Face and Periphery 0.004 Face of Steps 0.004 Bar Test 3 in. From End of Jaw Bar Diameter Same as Role 0.004	1 In. From Cellet Chuck 0 to 0.001
Recommended Standards		12 fa. to 18 fa., Incl.	Maximum 0.0004	To Face Hollow or Concare Only Dameter 0 to 0.001	On Diameter 0 to 0.001 on Face at Nominal Diameter 0 to 0.0015	Face and Periphery 0.003 Face of Stepa 0.003 Bar Test 3 In. From End of Jaw. Bar Diameter Same as Hole	1 In. From Coller Chuck 0 to 0.001
	Tool Ross		M azimum 0.0003	To Face Hollow or Concave Only on 12 In. Diameter 0 to 0.0005	On Dismeder 0 to 0.0005 on Face at Nominal Dismeter 0 to 0.001	Pace and Purphery 0.003 Face 0.503 Ear Test 3 In. From End of Jan. Prom End of Jan. Same at Hole 0.003	l In. From Collect Chuck 0 to 0.001
Test			LEAD SCRIPT CAN ACTION	CROSS SLICE ALCOMENT	FACE PLATE RUNDUT	CHUCK - RUNOUT	

MACHINERY'S Data Sheet No. 718, November, 1952

Approved by American Standards Association as B5.16—1952 PRECISION IN VOLUME JET BLADE PRODUCTION ...



MACHINE
GRINDS ROOTS
OF JET BLADES
AND BUCKETS

With this production-proved Style 85 Precision Two-Wheel Form Grinder both sides of the root forms of jet blades and buckets can be ground simultaneously. Automatic features permit unskilled operators to do the work quickly and accurately.

Wheel dressing and size compensation, work reciprocation, wheel feed and retraction, coolant control, unclamping, and lubrication—all these functions are automatic. Operator has only to load, unload, and press clamp and start cycle buttons.

For precision in volume jet blade production, install the "Ex-Cell-O Package" of jet blade finishing machines, including Style 86 Profile Miller, Style 87 Profile Grinder and Style 88 Profile Polisher. Write, wire, or phone Ex-Cell-O in Detroit or contact your local Ex-Cell-O representative today. Ask for Bulletin 50719.

Dovetail and pinetree forms are ground automatically from rough forgings.





EX-CELL-O CORPORATION

Ohio. Mr. Clarke will be engaged in the sale of special furnace heattreating equipment and will maintain headquarters at Quincy, Mass.

LYNDON B. BURNHAM is joining the Worcester Pressed Steel Co., Worcester, Mass., in the capacity of general sales manager. He will concentrate on sales of the company's made-to-order stampings of many different metals.

ALFRED EMERY has become associated with the L. S. Starrett Co.. Athol, Mass., as experimental engineer. Mr. Emery was previously with the Standard Gage Co.

ARTHUR F. NORLING has been assigned to the Cincinnati, Ohio, district, as outside sales representative. by the Chase Brass & Copper Co., Inc., Waterbury, Conn. Mr. Norling has been with the company since 1929. ARTHUR C. HOEY, who was Washington representative of the Kennecott Wire and Cable Co., has been transferred to the Cleveland. Ohio, district of the Chase Brass & Copper Co., Inc., a subsidiary of Kennecott. Mr. Hoey, a sales representative, will specialize in the sale of Kennecott Wire and Cable products. He is succeeding HAROLD F. SHERER, who is retiring after nearly thirty years of service. The Chase company has also announced at this time that research activities are being reorganized with the formation of a new research and development department under the direction of DR. D. K. CRAMPTON. The department will be reorganized at the Chase Metal Works in Waterbury.

Andrew Gagarin has been elected president of the Torrington Mfg. Co., Torrington, Conn., manufacturer of fan blades, blower wheels, and springmaking machinery. Mr. Gagarin joined the company in 1946, and was vice-president at the time of his promotion.

INDUSTRIAL BENCH & EQUIPMENT MFG. Co., New Britain, Conn., recently acquired the tools, dies, drawings, and machinery of the New BRITAIN MACHINE Co., Shop Furniture Division, New Britain, Conn.

REED A. WEYBURN has been named sales representative by the Flexible Tubing Corporation, Guilford, Conn. He will assist the manager of distributor sales.

Frank O. Hoagland, master mechanic of the Pratt & Whitney Division, Niles-Bement-Pond Co., West Hartford, Conn., is being awarded the Standards Medal for leadership in the development and application of voluntary standards at the annual meeting of the American Standards Association, in New York City, on



Frank O. Hoagland, who will receive the Standards Medal from the American Standards Association

November 25. This medal, which was established as an annual award, is the second one presented.

Brown & Sharpe Mfg. Co., Providence, R. I., announces the following changes in personnel: Thomas F. MacLaren, company representative, has been transferred from Los Angeles, Calif., to the Chicago, Ill., office, succeeding Howard K. Jackson, who has been given a special assignment; Frank K. Wilkey, who was located in San Francisco, Calif., has been appointed representative in the Los Angeles office, succeeding Mr. MacLaren; and Henry T. Spooner, who was at Providence, has joined the Los Angeles sales staff.

M. L. SNODGRASS has joined Sargeant & Wilbur, Inc., Pawtucket, R. I., in the capacity of sales manager of the heavy furnace division, and T. E. SCHROEDER has become affiliated with the company as chief engineer in the same division.

New Jersey

FEDERAL PRODUCTS CORPORATION, Providence, R. I., has opened a sales office at 1018 Stuyvesant Ave., Union, N. J., replacing the F. A. Brady Co., which served as representative for many years in the greater New York area. The new office will be under the management of JAMES G. GUNDERSON. Also assigned to this branch is ROBERT A. POWELL.

H. K. PORTER CO., INC., Pittsburgh, Pa., recently acquired the WATSON-STILLMAN CO., Roselle, N. J., manufacturer of forging steel fittings and hydraulic equipment. The latter company will continue as a division of the H. K. Porter Co., Inc., while its Fittings Division will also be op-

erated as a division of the Porter organization.

CARPENTER STEEL Co., Alloy Tube Division, Union, N. J., is making plans for the construction of a mill which will increase its production capacity by approximately 40 per cent for stainless steel pipe and tubing.

KURT ORBAN Co., INC., New York City, distributor of European-built equipment, has opened a machine tool service and demonstration center at 21 Prospect St., Newark, N. J.

KSM PRODUCTS, INC., stud-welding manufacturer, has moved to a new plant located on the outskirts of Merchantville. N. J.

PETER R. PRUNKI. has been named plant manager of the Tube Reducing Corporation, Wallington, N. J.

New York

W. S. TRUESDELL has been appointed to the newly created position of assistant general manager of the Buffalo Steel Division, H. K. Porter Co., Inc., Tonawanda, N. Y. Mr. Truesdell was general sales manager of the division at the time of his promotion. Thomas L. Bray has been named works manager of the Division. Mr. Bray will be in complete charge of all mill operations. He comes to the Buffalo Steel Division from the Connors Steel Co., another division of the company, where he was assistant to the general manager.

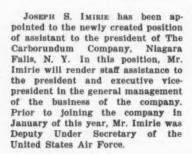
AIR REDUCTION Co., INC., New York City, producer of welding and cutting equipment and industrial gases, announces the following appointments: A. S. Blodget, Jr., manager of the Pittsburgh, Pa., district succeeding S. D. Edsall, deceased; and E. S. Twining, Jr., manager of the Boston, Mass., district. Mr. Twining was formerly assistant sales manager of the company's Philadelphia district.

CHARLES T. ZAORAL has been named vice-president in charge of operations by the New York Air Brake Co., New York City. ROBERT G. HESS has become manager of the company's main division at Watertown, N. Y. He was formerly president of the company's subsidiary, the Kinney Mfg. Co., this position now being filled by R. H. MITCHELL, formerly assistant to the executive vice-president.

WILLIAM K. UNDERHILL, sales manager of the New York City service plant of Joseph T. Ryerson & Son, Inc., Chicago, Ill., has been made assistant plant manager. Mr. Underhill, with the company at New York since 1922, has been sales manager for the past eight years.



Joseph S. Imirie, who has become assistant to the president of The Carborundum Company



CARL HIRSCHMANN Co., Manhasset, N. Y., importer of Swiss precision machine tools, and representative of many European machine tool builders, announces that it has absorbed the Hauser Machine Tool Corporation, also of Manhasset, another Swiss precision machine tool importer

TUBULAR PRODUCTS DIVISION, BAB-COCK & WILCOX Co., Beaver Falls, Pa., has established a district sales office at Syracuse with J. Y. McCanbless in charge. The office will be located at 205 Harrison St., Syracuse 2, N. Y.

DAVID S. Hopgson has been made district sales manager for the Producto Machine Co., Bridgeport, Conn. Mr. Hodgson will be located at the sales office and warehouse recently opened at 45 Scio St., Rochester, N. Y.

Ohio

PRECISION METALSMITHS, INC., Cleveland, Ohio, manufacturer of investment castings, announces the appointment of the Crandall Co. to its field sales organization. Representatives of the Crandall Co. are: WILLARD CRANDALL, Dayton, Ohio; HARRY EDWARDS, Milford, Ohio; and HOWARD A. MEANOR, Indianapolis, Ind.



David A. Thomas, executive vicepresident and general manager of Automatic Steel Products, Inc.

DAVID A. THOMAS has been appointed executive vice-president and general manager of Automatic Steel Products, Inc., Canton, Ohio. Mr. Thomas is a former executive of the Foote Bros. Gear & Machine Corporation, and was until recently executive vice-president and general manager of American Insulator Corporation.

A. N. Abelson has been appointed vice-president in charge of manufacturing by the Aro Equipment Corporation, Bryan, Ohio. Mr. Abelson was general manager of the Cleveland, Ohio, plant at the time of his appointment, and he will now be responsible for all production at both Bryan and Cleveland. John R. Markey, aircraft salcs manager, has been named assistant to the vice-president of the corporation.

JOSEPH E. KRUSE has joined the machine tool sales force of the Strong, Carlisle & Hammond Co., Cleveland, Ohio. Mr. Kruse was formerly head of the industrial engineering department of the Container Corporation of America, Cleveland Division.

MULLINS MFG. CORPORATION, Warren, Ohio, has organized the Koldfio Division devoted to the manufacture of cold extruded steel products under its "Koldfio" process. The Division will occupy a new building being erected as part of the main plant.

CASE INTERNATIONAL Co., importer and exporter of chemicals, machinery, etc., has moved to 1900 Superior Ave., Cleveland, Ohio.

IRVING R. TAYLOR is joining the Warren Machine & Die Division of the American Welding & Mfg. Co., Warren, Ohio, in the capacity of assistant manager.



Richard K. Schrecongost, manager of the die-casting machine division of Hydraulic Press Mfg. Co.

RICHARD K. SCHRECONGOST has been made manager of the die-casting machinery division of the Hydraulic Press Mfg. Co., Mount Gilead, Ohlo. Mr. Schrecongost has had fifteen years' experience in the die-casting field.

DIE SUPPLY SALES Co., a newly formed corporation that is taking over the sales and service responsibilities of the DIE SUPPLY Co., formerly at 915 Valley St., Dayton, Ohio, is moving to 311 Vermont Ave., in Dayton.

ELMER W. KRUEGER has been named vice-president of the Cleveland Pneumatic Tool Co., Cleveland, Ohio. Mr. Krueger has been operations manager since 1949, and a member of the board of directors since 1950.

Pennsylvania

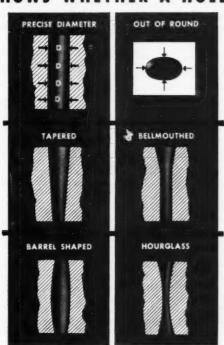
JOHN L. YOUNG, vice-president in charge of engineering for the U.S. Steel Co., Pittsburgh, Pa., was elected president of the Association of Iron and Steel Engineers, also of Pittsburgh, at the convention of the Association held in conjunction with the 1952 Iron and Steel Exposition. Other officers for 1953 are as follows: First vice-president, E. L. ANDERSON, superintendent, electrical department, Bethlehem Steel Co., Johnstown, Pa.; second vice-president, John H. Vohr, general superintendent, Gary Steel Works, United States Steel Co., Gary, Ind.; treasurer, W. H. Collison, assistant general superintendent, blast furnace division, Great Lakes Steel Corporation, Ecorse, Mich.; and secretary, J. D. O'ROARK, assistant to manager, service and maintenance, Weirton Steel Co., Weirton, W. Va.



Precisionaire Spindles show you what plug gages can't

-and wear 10 to more than 100 times longer!

A PRECISIONAIRE STANDARD SPINDLE SHOWS WHETHER A HOLE IS:



A Precisionaire and standard spindle shows you instantly whether a hole is dimensionally O.K.—and, if not, what the error is, where it is, and how much.

Precisionaire spindles prevent accepting bad parts in Receiving Inspection. In Production Inspection they show when and how to adjust a machine *before* scrap is produced. They prevent passing incorrect parts in Final Inspection.

Other Precisionaire spindles and fixtures for single and multiple gaging of internal and external diameters, squareness, concentricity, center distance, etc., are readily available.

A PLUG GAGE SHOWS YOU ONLY

Whether the hole being checked will assemble with a mating shaft of known diameter—It cannot measure any condition shown at the left.



Stock Delivery on Precisionaires—4 weeks delivery on Standard Spindles and Master Settings Rings Sizes .125 to 4.000". See your Sheffield Representative or write for new Precisionaire Catalog.



4947

the Sheffield CORPORATION

MARCUS M. CHAPMAN has been appointed assistant general manager of sales distribution, by the United States Steel Co., Pittsburgh, Pa. Mr. Chapman was formerly manager of sheet and strip sales, and the post he vacated will be filled by James P. Barton. Mr. Barton was assistant manager of sheet and strip sales at the time of his prometion.

FIBER GLASS DIVISION OF THE PITTS-BURGH PLATE GLASS Co., Pittsburgh, Pa., has established district sales offices at 205 W. Wacker Drive, Chicago, Ill., and 6045 Hamilton Ave., Detroit, Mich. CHARLES B. KEOWN will be Chicago district sales manager and CHARLES E. BARBY, Detroit manager.

R. H. FILSINGER, JR., has been named district manager at Pittsburgh, Pa., by the Vanadium Corporation of America, New York City, succeeding John B. Girdler, who was recently appointed sales manager of the corporation. Mr. Filsinger was eastern district sales manager prior to his appointment.

J. T. MAIDENS has become manager of the Philadelphia, Pa., territory of the Morse Twist Drill & Machine Co., New Bedford, Mass., where he will be assisted by WILLIAM ROGERS. Mr. Maidens was recently transferred from the Indiana district, being replaced there by James D. Oakley.

H. PAGELS was recently appointed vice-president in charge of manufacturing of the American Engineering Co., Philadelphia, Pa. F. C. MESSAROS has been made vice-president in charge of engineering for the company. He was chief ongineer.

Wisconsin and Minnesota

J. D. Greensward, director of manufacturing of the general machinery division, Allis-Chalmers Mfg. Co., Milwaukee, Wis., has been named vice-president. Also announced was the appointment of P. F. Bauer as general manager of the Norwood Works and manager of the concern's apparatus department, succeeding Mr. Greensward.

INTERSTATE DROF FORGE Co., Mil /aukee, Wis., announces the addition of the following sales agents to the staff of its Special Products Division: Louis W. Appell Co., 11 Warren St., New York City; Fred W. Smith, 3901 Main St., I-C, Buffalo, N. Y.; William Abell, 1082 Highland Ave., Needham Heights, Mass.; and Merrell Wood, 17880 Lake Ave., Cleveland, Ohio.

FREDERICK E. WENZEL, works manager, has been made general manager of the Trent Tube Co., East Troy, Wis., producer of stainless and alloy steel tubing. Mr. Wenzel also becomes a director of the company.

AMERICAN BEARING Co. has recently been established at 1705 Hawthorne Ave., Minneapolis 3, Minn., by S. H. Friedman, formerly of Chicago, Ill. The concern will carry a complete line of standard brand ball and roller bearings acquired from surplus markets, supplemented by factory stocks.

Coming Events

NOVEMBER 8—Second Annual Tool Engineering Conference of Chapters in Indiana, Illinois, Iowa, Missouri, Wisconsin, and western Michigan of the American Society of Tool Engineers, at the University of Illinois, Urbana, Ill. Further information can be obtained from R. K. Newton, Supervisor of Conferences, 205 Arcade Bldg., University of Illinois, Urbana, Ill.

NOVEMBER 19-25—Thirty-fourth annual meeting of the American Standards Association at the Waldorf-Astoria in New York. Headquarters of Association, 70 E. 45th St., New York 17. N. Y.

NOVEMBER 20-21—Seventh Mid-West Conference of the American Society for Quality Control at the Claypool Hotel, Indianapolis, Ind. For information, address Dale A. Cue, 5565 Brookville Road, Indianapolis, Ind.

DECEMBER 1-6—Twentieth National Exposition of Power and Mechanical Engineering at the Grand Central Palace, New York City, under the auspices of the AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Executive assistant secretary, Ernest Hartford, 29 West 39th St., New York 18, N. Y.

JANUARY 19-22, 1953—PLANT MAINTENANCE CONFERENCE AND SHOW at the Public Auditorium, Cleveland, Ohio. For further information, address Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N. Y.

MARCH 23-27, 1953—Eighth Western Metal Congress and Exposition sponsored by the AMERICAN SOCIETY FOR METALS, to be held in the Pan-Pacific Auditorium, Los Angeles, Calif. Secretary, W. H. EISENMAN, 7301 Euclid Ave., Cleveland 3, Ohio.

JUNE 16-19, 1953—National Spring Technical Meeting and Welding and Allied Industry Exposition of the AMERICAN WELDING SOCIETY at the Shamrock Hotel, Houston, Tex. Executive secretary, J. G. Magrath, 33 W. 39th St., New York 18, N. Y.

A jet bomber flying 600 miles per hour develops the equivalent of 55.680 H.P.

Obituaries

FRED H. HAGGERSON, chairman of the board of the Union Carbide and Carbon Corporation, New York City, died on October 14 after a short illness, at the age of sixty-eight years. Mr. Haggerson was born in 1884 in Spalding, Mich., and attended Hamilton College and the Law School of the University of Michigan, from which he was graduated with the Bachelor of Laws degree in 1907. He then practiced law in Menominee. Mich. In 1919, he became associated with the law department of the Union Carbide and Carbon Corporation.

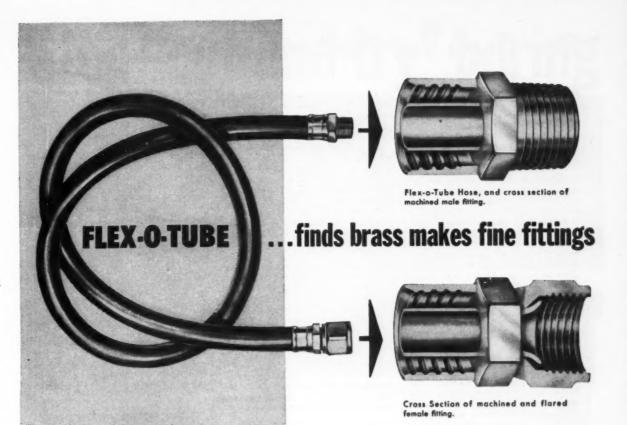
Mr. Haggerson had been with Union Carbide for over thirty-three years. In 1938, he became vice-president of the corporation, in 1941 a director and three years later, president and a member of the executive committee. Because of his leadership in the field of metals, he was awarded the 1949 Medal for the Advancement of Research, presented by the American Association for Metals. Mr. Haggerson is survived by a son and a daughter.

FREDERICK L. CURTIS, retired vice-president of Raybestos-Manhattan. Inc., and former general manager of the Manhattan Rubber Division, Passaic, N. J., died on September 20 at his home in Passaic at the age of eighty-four years. Mr. Curtis joined the Manhattan-Raybestos Mfg. Co. in 1893, and held successively many positions. In 1913, he became vice-president, and when the company merged in 1929 to form Raybestos-Manhattan, Inc., he became treasurer. From 1940 until his retirement ten years later, he was general manager.

EDWARD E. AMES, retired chairman of the board of the General Box Co.. Des Plaines, Ill., died on September 28 in Ormond Bea-h, Fla., at the age of seventy-one years. Mr. Ames was one of the founders of the company in 1922, and served as vice-president and director of sales until his r-tirement in 1946. He was chairman of the board from 1949 to March, 1952. He is survived by his widow, a daughter, and two sons.

Annual Index to MACHINERY

The annual index to Volume 58 of MACHINERY (September, 1951, to August, 1952, inclusive) is now ready for distribution. Subscribers who have not previously requested copies can obtain them without charge by writing to Machinery, Circulation Department, 148 Lafayette St., New York 13, N. Y.



For quick, accurate and economical machining, free-cutting brass rod is preferred by many companies, such as Flex-O-Tube, Division of Meridan Corporation, Detroit, Mich. This company makes hose assemblies and fittings to conduct air-oil-water-gasoline and hydraulic power for the automotive, farm implement, machine tool and aircraft industries. Some of these hoses have a minimum bursting pressure of 20,000 pounds per square inch, which gives an indication of the tightness required, which can be obtained only by strength and accuracy.

Flex-O-Tube has found six points of superiority for brass over other metals, as follows:

- 1. Brass "flows," or is ductile, so that no cracks result during the crimping operation required to fasten the fittings to the hose.
- 2. Ductility and strength inherent in brass act to provide a superior seat to fittings designed to control fluid flow. Competitive metals are either too hard or too soft to give positive closing and tend to leak.
- 3. Where the design of the fitting is intricate, necessitating removal of considerable metal by machining, the automatic screw machines can be run faster with free-cutting brass rod.
- 4. Brass has a high scrap value, and the scrap sold back to the mill increases brass supplies.
- 5. The break-even point between brass and other metals is especially favorable to brass in the sizes of rod that Flex-O-Tube buys.

6. Customer preference is for brass, which is universally recognized as a quality metal. Hence brass fittings are more readily sold, and in fact often are specified regardless of size or price differentials.

Included in the Flex-O-Tube operations are machining, flaring, crimping, and annealing to assure the proper ductility for flaring and crimping.

Revere is an important supplier of brass rod to Flex-O-Tube, and has also collaborated with this customer through the Revere Technical Advisory Service.

If you wish information about brass and how one or more of the Revere brasses can add to the economy and saleability of your product, get in touch with the nearest Revere Sales Office. See your telephone directory or write direct.

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

Tannaeu op Fant Revere in 1801
230 Park Avenue, New York 17, N. Y.

Mills: Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles, and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y.
Sales Offices in Principal Cities, Distributors Everywhere.

SEE REVERE'S "MEET THE PRESS" ON NBC TELEVISION EVERY SUNDAY

New Books and Publications

INVESTMENT CASTINGS FOR ENGINEERS.
By Rawson L. Wood and Davidlee
Von Ludwig. 477 pages, 6 by 9
inches. Published by the Reinhold Publishing Co., 330 W. 42nd
St., New York 36, N. Y. Price,
\$10.

To define clearly what actually may be accomplished by means of the various commercially important modifications of "lost-wax" findings which are presently in use is the purpose of the authors in writing this book. It is not their intent to acquaint engineers with the details of production, but rather to deal with such basic and probably unchanging principles as are now known to be essential to the design, production, and application of reliable, economically competitive "precision" castings. Most of the material in this book had to be developed and organized by study of the actual processes as they are currently understood.

After a brief history and description of investment castings, the following subjects are treated: the master pattern and pattern die; making soft metal dies; wax versus plastic patterns; frozen mercury for disposable patterns; gating, risering. clustering, and venting wax and plastic patterns: investment materials and techniques; the ceramic shell mold or Mercast process; melting and casting methods; selection of low-temperature non-ferrous alloys for investment casting purposes; selection of ferrous and refractory alloys; foundry finishing investment castings; foundry inspection operations; how to machine investment castings; product design development by means of investment castings; castings to replace fabricated parts; design suggestions for investment castings; investment castings for chemical and high-temperature resistant applications; some metallurgical observations of investment cast alloys; and some machinability tests on stainless steel.

NONFERROUS PHYSICAL METALLUBGY. By Robert J. Raudebaugh. 345 pages, 6 by 9 1/4 inches. Published by the Pitman Publishing Corporation, 2 W. 45th St., New York 19, N. Y. Price, \$6.50.

The purpose of this book is to discuss the more important non-ferrous metals from the aspect of physical metallurgy. Particular emphasis is placed on recent developments in their processing, fabrication, and application. Among the developments under consideration are the following: the melting and casting of reactive metals such as molybdenum; the direct casting of billets and slabs

of aluminum, magnesium, and copper alloys; the fabrication of ductile titanium; and the application of powder metallurgy to the production of non-ferrous parts.

An idea of the scope of the book will be obtained from the chapter headings: Aluminum and Its Alloys; Magnesium and Its Alloys; Copper and Its Alloys; Nickel and Nickel Alloys; Alloys of Cadmium, Lead, Tin, and Zinc; Some Less Widely Produced Nonferrous Metals and Their Alloys; and Powder Metallurgy and Refractory-Metal Composites.

SPECIFICATIONS FOR COPPER AND COPPER-ALLOY WELDING RODS. 13 pages, 6 by 9 inches. Published jointly by American Welding Society, 33 W. 39th St., New York 18, N. Y., and American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. Price, 40 cents.

The latest specifications for filler metal (AWS Designation A5.7; ASTM Designation B 259), covering copper and copper-alloy welding rods for use with oxy-acetylene, carbon arc, and inert-gas metal-arc welding.

AMERICAN STANDARD MOUNTING DIMEN-SIONS OF LUBRICATING AND COOL-ANT PUMPS FOR MACHINE TOOLS, ASA B5.28-1952. 11 pages, 8 1/2 by 11 inches. Published by the American Society of Mechanical Engineers, 29 W. 39th St., New York 18, N. Y. Price, \$1.

This standard has been prepared to establish mounting dimensions for lubricating and coolant pumps as applied to machine tools in order to facilitate their replacement.

AMERICAN STANARD SAFETY CODE FOR FORGING AND HOT METAL STAMP-ING, B24.1-1952. Published by the American Standards Association, 70 E. 45th St., New York 17, N. Y. Price, \$1.

Tester for Determining Hardness of Hot Metals

Increasing demand for alloys to withstand higher temperatures has prompted three metals engineers of the United States Steel Co.'s research laboratory, Kearny, N. J., to develop an ingenious hot-hardness tester. Both the indenter tip of the device and the metal sp 'men are enclosed in a laboratory furnace, which brings the heat to the desired test temperature, and loading weights are applied to balanced ends of a beam above the furnace. The specimen rests on

a testing stage, elevated or depressed by both a coarse and a fine screw jack adjustment beneath the furnace. At the touch of a starting switch, the loaded beam that operates a perpendicular rod tipped by the indenter, is dropped.

With the indenter tip and specimen at the same temperature, greater accuracy ha been attained in hothardness measurements. Sapphire indenter tips proved more satisfactory than diamond tips, which first were utilized. Diamonds evinced a tendency to disintegrate after continued use above 1300 degrees F., while the sapphire tip has rendered long service above 1500 degrees F. without disintegration.

Standard Machine and Wood Screw Gage

A gage for determining the size of machine and wood screws from No. 0 to 14 is shown in the accompanying illustration. The screw sizes are determined by calibrations on the right-hand side of a taper:d slot in the gage. On the left-hand side of the tapered slot is a scale graduated



Gage for determining machine and wood screw number sizes

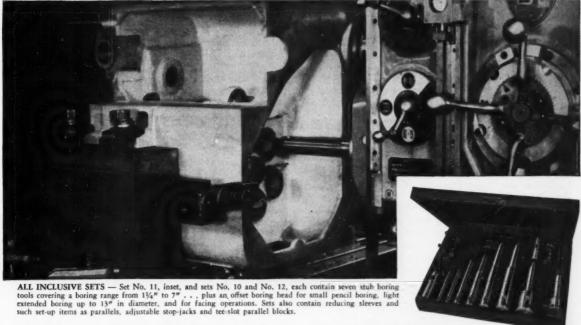
in thirty-se onds of an inch, which will determine quickly the diameters of rods, shafts, etc. Diameters varying by sixty-fourths of an inch can also be determined.

A new material has been introduced in this standard screw gage, which is aid to compensate for wear. The gage is now rustproof, and is made from 1/16-inch high-finish sheet steel. This gage can be obtained free of charge from the Dayton Rogers Mfg. Co., Minneapolis 7, Minn., when requested on a company letter-head.

The average U. S. aircraft manufacturer needs 150 times as many engineers today as in 1927—yet the 1953 graduating class will probably number less than half that of 1950.

. . .

Stop "cut and try" boring



Use DAVIS "Super" Micrometer stub boring tool sets

- √ Adjust to within .0001".
- **√** Rugged for heavy boring.
- J Precise for fine finishes.
- 10 complete, convenient standard sets equipped with highspeed steel cutters to choose from.
- ✓ Stellite, tungsten or super high speed cutters also available.

THE handiest production boosting tool sets on the market. For use with horizontal boring, drilling and milling machines . . . vertical or horizontal boring machines . . . turret lathes . . . vertical turret lathes . . . or milling machines. Available for almost immediate delivery. Modifications in any set can be made to meet your exact requirements.

ABBREVIATED SETS—Set No. 18 and set No. 19 each contain seven rugged tools covering a range from 3/8" to 7" diameter with the largest tool arranged to receive pencil boring tools for small diameter boring.

The five sets listed, plus the five other sets are all equipped with high speed steel cutters. Other cutters of stellite, super high speed or tungsten carbide tipped can be furnished. Get all the details today by filling out and returning the coupon.

WHATEVER YOUR BORING PROBLEM,
IF DAVIS CAN'T BORE IT—
IT CAN'T BE DONE



DAVIS BORING TOOL DIVISION

GIDDINGS AND LEWIS MACHINE TOOL COMPANY FOND DU LAC, WISCONSIN

Please send me comp	plete details.
Name	
Address	
Company	
City	State

"Building for the Future of America" is Theme of A.S.M.E. Annual Meeting

The recently released advance program augurs well for a number of highly informative and thought-provoking sessions at the 1952 annual meeting of the American Society of Mechanical Engineers. The theme for the meeting -to be held in New York City November 30 to December 5-is "Building for the Future of America." Two hotels, the Statler and the McAlpin, have been designated as headquarters.

Among the papers to be presented at symposiums which will be of particular interest to personnel in the metal-working industries are "Appearance Comes in Three Shades," by Michael W. Papp, Warner & Swasey Co.; "Design of Shrink Fits," by Paul R. Paslay, Rice Institute, and Robert Plunkett, General Electric Co.; "Investigation of Cemented Tungsten Carbide as a Bearing Material in the Medium-Speed Range Using Different Lubricating Oils, by J. S. Kozacka, University of Illinois, H. A. Erickson, D. A. Stuart Oil Co., H. W. Highriter, Vascoloy-Ramet Corporation, and A. F. Gabriel, Acme Industrial Co.; "Metallurgy and Production and Suitable Light-Metal Ingots for Large Forgings and Extrusions," by Thomas L. Fritzlen, Reynolds Metals Co.; and "The Large Extrusion Press and Its Production Problems," by T. F. McCormick, Aluminum Company of America.

Other pertinent papers are "Metal-Cutting Behavior of Titanium," by L. V. Colwell, University of Michigan, and W. C. Truckenmiller; "Metal - Cutting Chatter and Its Elimination," by R. S. Hahn, Heald Machine Co.;

"A Lathe Test for the Evaluation of Cutting Fluids," by J. D. Oathout, W. L. Howell, J. P. Hamer, and H. L. Leland, Standard Oil Development Co.; "Practical Application and Problems in Abrasive Belt Grinding," by H. W. Bennett, Behr-Manning Division of the Norton Co.; and "Gaging and Sorting Electronically," by A. C. Sanford, Federal Products Co.

In addition to the technical sessions, inspection trips to near-by plants of interest to the Society membership are scheduled. The Twentieth National Power Show, under the auspices of the A.S.M.E., will be staged in Grand Central Palace in New York City, from December 1 to 6. The annual business meeting of the Society will be held on Monday, December 1, when Frederick S. Blackall, Jr., president and treasurer of the Taft-Peirce Mfg. Co., will be installed as the new president of the A.S.M.E.

Hinged Jigs and Hand Router Speed **Trimming Operations**

A set of three small hinged jigs and a hand router are being used in the sheet-metal shop at Temco Aircraft Corporation of Dallas, Tex., to trim tooling tabs from aircraft skin sections. This method is fast and eliminates most of the handling, rework, and scrap

which resulted from the method formerly used. Previous to the development of the jigs, tooling tabs were removed with hand shears or band saws, the method depending on the skin thickness.

Each of the new jigs is made from two fiber strips, hinged together so that one fits flat on either side of a stack of skin sections. The strips are faced with felt to prevent damage to the skin surfaces. One of the fiber strips serves as a router guide and has a metal edge to prevent excessive wear. The jigs are made in sets of three, with straight, concave, and convex edges, respectively, so that tabs may be trimmed from curved as well as straight edges. Two adjustable stops insure accurate positioning of the jigs on the skin sections, and they are held firmly in place by quick-acting clamps, as shown.

From two to ten skins may be trimmed simultaneously, the number depending on the thickness of the material. Positioning pins are inserted in holes to keep the skins in alignment until the jigs are clamped in place.

One of two hinged fiber strips in this jig serves as a router guide for trimming tooling tabs from aircraft skin sections.





make estimated savings of

on 200 planes*

By estimating cost of making 30 various parts for 200 planes on different types of forming machines, the Hufford Model 46 equipped with the new Hydra-Curve Jaws showed a material saving alone of \$20,180.00! In addition, \$3617.40 in labor savings would be effected.

These figures are indicative of the money-saving advantages possible with the new Hufford Hydra-Curve Jaws on Hufford Stretch-Wrap Forming Machines.

BUT MATERIAL SAVINGS ARE NOT ALL...The Hydra-Curve Jaws lower transitional area stresses between die and jaw, reducing sheet breakage losses; overcome wrinkling and insure better skin fits, which cut assembly time. With these new curvable jaws, many jobs are being successfully formed in the "T" condition, saving furnace hours. DIE COSTS ARE LOWERED TOO because expensive-to-make dish-outs are no longer required to relieve stresses.

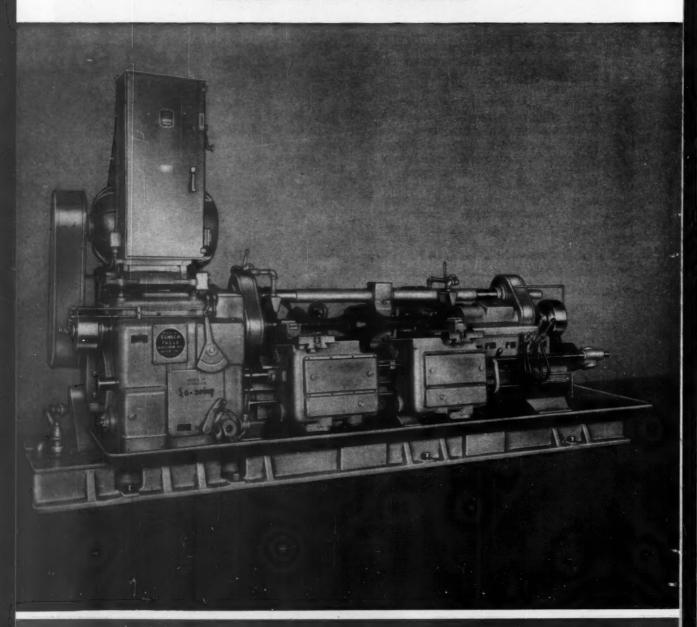
If you want new cost reductions, if you want stretch-wrap forming at its best, rely upon Hufford . . . FIRST IN THE FIELD, FIRST IN SALES, FIRST IN SAVINGS!

*All figures from the files of a leading aircraft manufacturer. Name on request



MACHINEOF

MODEL "AR" So-swing WITH DOUBLE END DRIVE CUTS MACHINING COSTS ON REAR AXLE HOUSING



PRODUCTION COSTS

THE MONTH

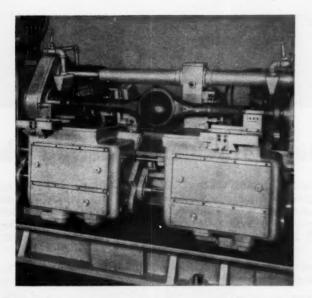
PREPARED BY THE SENECA FALLS MACHINE CO. "THE So-swing PEOPLE" SENECA FALLS, NEW YORK

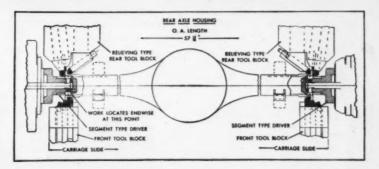
Problem: To turn and face both ends of Rear Axle Housing simultaneously.

Solution: The Model AR Automatic Lo-swing Lathe selected for this job was equipped with a Double End Drive to secure a balanced, efficient drive and prevent torsional deflection of the Axle Housings while under cut.

The right-hand Head of the Double End Drive Mechanism is a massive, two-piece unit securely clamped to the ways of the bed. Its top part slides on large bearing surfaces and is pneumatically-operated to facilitate loading and unloading of the work. The large diameter drive shaft for this head is splined to permit free longitudinal movement of the sliding member, and is supported with a central bearing.

The close-up view below shows details of the tooling and also the two spring-loaded





vibration dampeners which prevent vibration of the out-of-balance part when revolved at high speed. This view also shows the two front carriages; the left-hand carriage feeds towards the headstock while the right-hand carriage feeds towards the tailstock. The mechanism for reversing the feed on the right-hand carriage is enclosed in the housing shown on the extreme right-hand end of the bed in the overall view.

The axle housing is driven with two pneumatically-operated expanding segments... the air operating cylinders being mounted directly on the right and left hand Driving Head Spindles. Details of the tooling are shown in line drawing.

The operating cycle consists of loading the Axle Housing in two cradles, after which the sliding member of the right hand head advances and locates the housing endwise in relation to the driving chucks. This first movement is controlled by a four-way air valve at the right hand end of the machine. The second movement of this valve closes the two driving chucks. The machine is then started with the main clutch control lever located on the right side of the right-hand carriage, which is the normal operating position.

The automatic machining cycle then takes place and the machine stops automatically at the end of the cycle, ready for unloading and reloading. Consult Seneca Falls Engineering Staff on your turning problems.

SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

ARE LOWER WITH Lo-swing



A. A. Miller (center), general partner of Miller Products, and Donald Sanderlin (right), shop superintendent, tell Standard Oil's W. P. Spencer how STANICUT Cutting Oil reduced rejects on turret lathe boring job.

Ends taper troubles on boring job

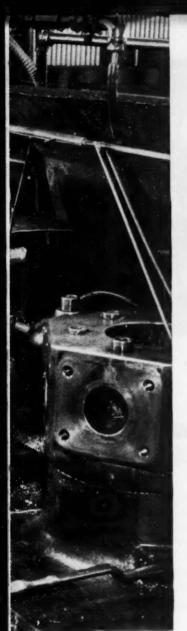
• Miller Products of North Chicago, Illinois, used a turret lathe boring operation to produce dynamotor housings from 1015 steel tubing. Various cutting oils were tried on this job. With all but one of these oils, taper on the bore of the housings was excessive. In some cases, only one hous-Stanicut Oil 107 BC, recommended by a Standard Oil lubrication

ing out of fifty was acceptable. Stanicut Oil 107 BC, recommended by a Standard Oil lubrication specialist, alone produced satisfactory results!

With the use of this cutting oil, taper has been kept to a minimum. Tool life and finish have been excellent. Production has averaged between 80 and 132 housings per tool change.

Of still greater benefit to Miller Products, STANICUT has proved its ability to handle a wide variety of difficult machining jobs. Operators have used it successfully on stainless steel, stress proof steel, and 4140 steel in turret lathes, automatic screw machines, and threaders.

Make the experience of Miller Products your basis for trying STANICUT Cutting Oil. You can get the help of a Standard lubrication specialist by phoning your local Standard Oil (Indiana) office. Or, write: Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.



What's YOUR problem?



W. P. Spencer, lubrication specialist in Standard Oil's Chicago office, worked closely with Miller Products to help them solve a serious machining problem.

To help you with similar problems, Standard Oil has a corps of lubrication specialists located throughout the Midwest. One of these men is near your plant. He is close-at-hand to give you the assistance you need when you need it. His wide experience and special training in the use of modern lubricants and cutting fluids will help you make real savings. You can reach him quickly and easily by phoning your local Standard Oil Company office. Arrange soon for his visit and find how you can profit further through Standard's unique servicesupply set-up.



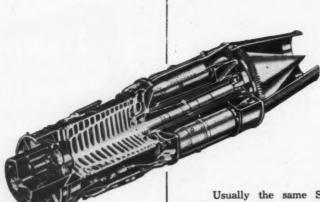


STANDARD OIL COMPANY

(INDIANA)

You'll find the means to significant savings in this booklet. It describes the important qualities of Standill Industrial Oil and the resultant benefits which have made this multi-purpose oil the choice of midwest manufacturers for a host of lubricating jobs. Discover how Stanoil will give you superior protection through its unique combination of six outstanding characteristics, including high stability and effective rust prevention. Find how Stanoil can simplify stock, storage, and inventory in your plant by replacing special-purpose oils in a wide variety of equipment. Ask the Standard lubrication specialist from your nearby Standard Oil office for this booklet, or write: Standard Oil Company (Indiana), 910 South Michigan Ave., Chicago 80, Illinois.

Why inventory hundreds when these II Standard up to 80% of your single-point



THE Broad Versatility of Standard Carboloy Tools and Blanks Includes Machining High-temperature Alloys

Today, titanium and most other so-called high-temperature alloys, such as those used in jet-engine manufacture, can be machined more successfully with cemented tungsten carbide than with any other cutting material ... a great majority with straight tungsten carbide grades, such as found in Standard Carboloy Tools. Carboloy Tool engineers have intensively studied the machining of tough-alloy materials, and are able to present for your use the following:

Usually the same Standard Carboloy Tools you would use on cast iron will work very well. For heavy, rough cuts select a tough "Standard" grade. For lighter cuts, use harder, more wear-resistant grades. Hightemperature alloys tend to workharden, Standard Carboloy Tools are ideal because they hold a good cutting edge. Tools should be designed to be as freecutting as possible; top side rake should be greater than normal, and a very small nose radius used. Cutting speeds vary widely between 75 f.p.m. and 600 f.p.m. Best feeds are .010" to .020" per revolution.

For specific, detailed advice on your particular problem, write to us, giving full details. Our engineers will promptly give you their recommendations.





Standard Carboloy Tools give you top production at top speeds...maximum return per tool dollar

Not only do Carboloy Standards drastically cut your inventory, but actual production and cost figures compiled on an industry-wide basis in all types of shops prove beyond all question that Carboloy Tools

- . . . multiply production many times over
- . . . diminish tool and maintenance costs
- . . . outproduce, outlast steel tools up to 10 to 1.

Your continuing quest for greater production at lower cost is aided by such specialized Carboloy services as these: the Customer Training School, which shows your supervisory personnel how to get the maximum results with carbides; our wide range of training material—free manuals, technical charts, slide films showing techniques, and many others; and actual on-the-job instruction and assistance by our skilled tool engineers.

Remember, too – your needs on "rush" jobs are often answered by economical Carboloy Blanks, which may be quickly and easily brazed to tool shanks without waiting for specials.

For further information, mail the coupon, or call an Authorized Distributor or a Carboloy Field Engineer. Is there a better time than NOW?

"Carbolay" is the registered trademark for the products of Carbolay

Department of General Electric Company

Plants at Detroit, Michigan; Edmore, Michigan; and Schenectady, New York



CA	R	R	0	L	0	Y

DEPARTMENT OF GENERAL ELECTRIC COMPANY 11147 E. 8 Mile Road, Detroit 32, Michigan

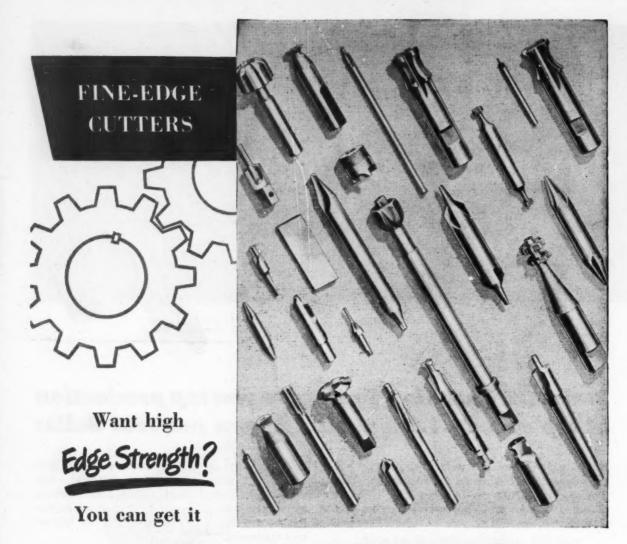
Please send me, without cost or obligation, Carboloy General Tool Catalog, GT-250.

NAME POSITION

COMPANY....

CITY......ZONE....STATE.....

Our Authorized Distributor is



with DBL-2 HIGH-SPEED STEEL

Write for copy of "CUTTING TOOL MATERIALS"

Allegheny Ludlum produces all types: the various tungsten and "moly" high-speed steels, castalloy materials, and cemented carbides. This 36-page booklet analyzes and compares types, and covers grade selection, etc.—invaluable data for production men. Write for your copy.

ADDRESS DEPT. M-35

A midwestern tool manufacturer, specializing in fine-edge cutting tools, has found DBL-2 best for their purpose—added proof of the high edge strength and excellent cutting qualities of this high-speed steel.

DBL-2 (typical analysis: C .80, W 6.00, Mo 5.00, Cr 4.00, V 1.75) represents the 6-6-2 or M-2 type of tungsten-molybdenum high-speed steel. DBL-2 combines high hardness with toughness. Requiring no more

than reasonable care in hardening and tempering, you will find it a high-speed steel of great possibilities—capable of giving you performance equal to, or better than, the general-purpose tungsten types, and at reduced cost.

DBL-2 reliability has been proved in a wide variety of cutting tools. Let us help you to use DBL-2 . . . our Mill Service Staff is at your command.

• Allegheny Ludlum Steel Corporation, Henry W. Oliver Bldg., Pittsburgh 22, Pa.

For complete MODERN Tooling, call Allegheny Ludlum



FORM GRINDING

JET ENGINE BUCKET ROOTS FROM THE SOLID!

ON J&L DUAL-WHEEL AUTOMATIC FORM GRINDERS

MATERIAL BORDERS ON UNMACHINABLE Intense heat and great centrifugal stresses on the pressure surfaces require the toughest material and most accurate finish.

FEW MORE DIFFICULT GRINDING JOBS EXIST - Yet both sides of the root are ground simultaneously, to gage tolerances, on a production basis.

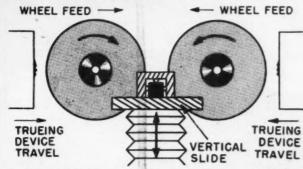
REPETITIVE ACCURACY MAINTAINED

Spacing of pressure surfaces within .0002 Taper within .0005 Angles within 10 minutes

Thickness from .0005 to .001

ACHIEVEMENT RESULT OF SEVERAL YEARS' RESEARCH AND EXPERIMEN-

TATION - This application of the proven principles, long incorporated in J&L Thread Grinders, was initiated several years ago. The first machine was delivered in 1948. Continued study and subsequent refinements have helped lick one of the toughest machining problems of our day. Perhaps we can help you too.



Bucket is mounted on a reciprocating vertical slide for two-way grinding.

AUTOMATICITY SPEEDS PRODUCTION - MAINTAINS REPETITIVE ACCURACY - Operation is simplified to the push button stage by a completely automatic work cycle.

Automatic wheel trueing assures accuracy of form - includes finish

Automatic compensation for amount dressed off the wheels. and automatic wheel feed assure accurate sizing.

trueing before final cut.



5120

Before the grinding operation, the foil contour is checked, the blade oriented and cast into a matrix, on a special 16 L Optical Comparator. The matrix serves as a fixture for subsequent operations.



JONES & LAMSON MACHINE CO., Springfield, Vt., U.S.A. Dept. 710

Machine Tool Craftsmen Since 1835

THREAD GRINDER DIVISION

MACHINERY, November, 1952-269



Royal Egyptian train equipped with RIV Journal Axle-boxes on a Genoa pier, awaiting loading on board ship

RIV - OFFICINE DI VILLAR PEROSA S. p. A. TURIN (ITALY)

ESTABLISHED IN 1906: elmost 50 years of steady development are a generally of vide engineering experience.

3 PACTORIES: at Taris, Wiler Perces, Apaesis, covering ellegether on over of 200'00 square motors, consisten on industrial group of high productive possibilities.

100 ENGINEERS: place their technical trionlodge and practical experience at the service of every customer.

1500 OFFICE WORKERS: make up on efficient commercial on

9000 WORKHEN: contribute their labor and skill to an over improving and increasing production.

8000 MACHINE TOOLS: mean on industrial expectly of world

CONTROLS AND INSPECTIONS: carried set at every mean-

1771 BROADWAY

RIV manufacture: Single-row Radial Ball Bearings • Double row Radial Ball Bearings • Self-aligning Radial Ball Bearings • Single-row Angular-contact Ball Bearings • Double-row Angular-contact Ball Bearings • Cylindrical Roller Bearings • Single-row Barrel-shaped Roller Bearings • Double-row Barrel-shaped Roller Bearings • Needle Roller Bearings • Taper Roller Bearings • Single-thrust Ball Bearings • Double-thrust Ball Bearings • Thrust Barrel-shaped Roller Bearings • Shielded Bearings • Sealed Bearings • Balls, Rollers and Needle Rollers • Pillow Blocks • Tram- and Railway Journal Axle-boxes • Journal Axle-boxes for Small Wagons • All types of special bearings, in every size (metric and inch dimensions), with outside diameters ranging from 10 mm to over 4 meters, for every application.



C & C SALES CORPORATION

President NEW YORK 19, N.

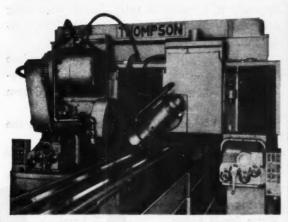


New Thompson Way Grinder Developments

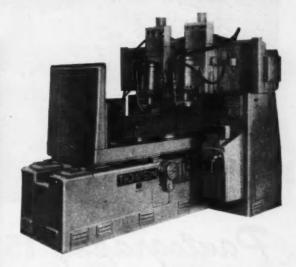
Reduce Costs ... Speed Machine Tool Production

Way Grinders now available with single, multiple heads, or combinations of horizontal and vertical heads and in sizes to meet all requirements.

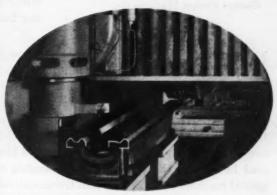
Thompson has produced machine tool way grinders in many types and sizes that have eliminated handwork and produced economical and accurate ground ways. However, recently increased production grinding of ways has been made possible by many new Thompson Way grinding developments such as: automatic grinding and truing cycles; dual vertical or horizontal heads for grinding ways different heights; horizontal multi-wheel grinding and vertical side and undercutting head; Hydrail way grinding for giant columns or bed ways. Three of the new Thompson Way Grinders are shown here.



Designed especially for extremely large machine tool way grinding is this typical Thompson Hydrail Way Grinder. Size 48" x 48" x 192". Part: grinder bed ways.



One of several new Thompson Double Head Dovetail Way Grinders installed to speed work and hold accuracy in the plant of a leading lathe manufacturer.



Multi-wheel grinding with auxiliary vertical head. Equipped with horizontal spindle having dual spaced wheels and auxiliary inclinable spindle. The front contoured grinding wheel grinds the rear set of ways and the rear grinding wheel grinds the front set, with vertical head grinding the sides and undersurface of the ways and rack seat.

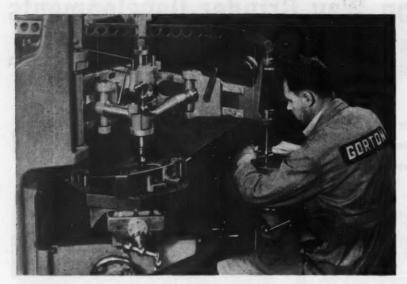
Write for details Today.

The Thompson Grinder Company, Springfield, Ohio

Copyright 1952-The Thompson Grinder Co.

Thompson Grinders

MACHINERY, November, 1952-271



Tracer-Controlled Pantograph cuts and rounds thermal slot in 8-foot steel propeller blade in 40 minutes; previous time was 5 hours, 10 minutes — just one of hundreds of examples of time and cost saving with tracer-controlled Pantograph machines.

Pantography IS NEW -

By George Gorton III
Executive Vice President,
George Gorton Machine Co.

— in the sense that industry at large and Metal Working people in particular are just beginning to appreciate the many advantages Pantography offers to those faced with the Design-Production problems of today and tomorrow.

INDUSTRY'S foremost responsibility right now is to produce faster, to highest quality standards and at lower cost — whether on defense contracts or for our civilian needs.

Today, there are literally thousands of operations being performed throughout industry which can be speeded up, improved in quality and lowered in cost by the use of available models of special machine tools. The modern tracer-controlled Pantograph machine is such a tool. It is both a special purpose machine, ideal for short runs, and it is an accurate single purpose machine which turns out identical parts or pieces to meet tight production schedules.

The tracer-controlled Pantograph machine is used for inside and outside profiling, routing, die sinking, mold cutting, counterboring, contour milling, chamfering, grooving, graduating and engraving in ferrous and non-ferrous metals, as well as in plastics.

This machine performs on flat, uniformly curved, cylindrical, spherical or irregular shapes—it works in either 2 or 3 dimensions, in all directions on a horizontal plane, and vertically. It

employs enlarged masters, templates or patterns which are quickly and easily made and operates normally at a reduction ratio thereby increasing accuracy — exclusively characteristic of the pantograph.

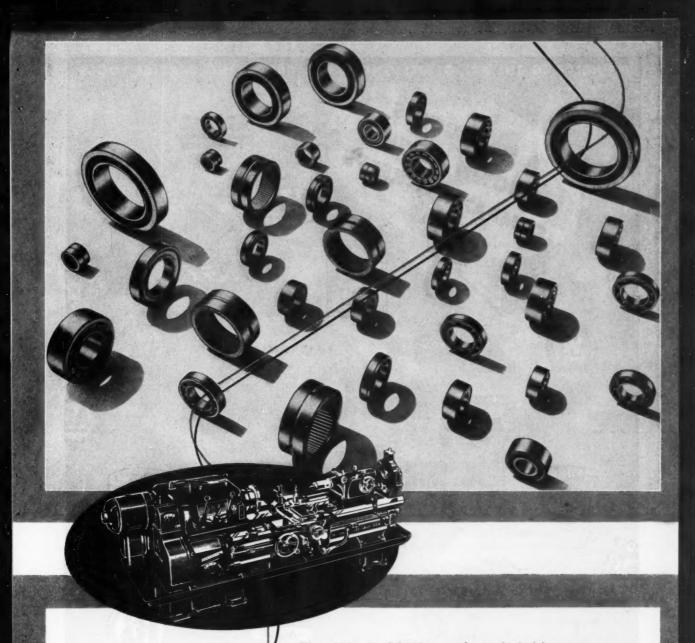
Single or repetitive accuracy — from one piece to thousands — manual or full automatic operation depending upon quantities — work sizes from the size of a dime to as large as 10 feet.

A new booklet, "Pantography," explains the

process and shows what this type of machine can do for you. It is yours without obligation. Write for it today. If interested, also ask for our latest General Catalog 1655. Address the George Gorton Machine Co., 1311 Racine Street, Racine, Wisconsin, U. S. A.



272-MACHINERY, November, 1952



AS FRICTION FREE AS

These 38 headstock bearings are about a third of the 115 heavy-duty precision anti-friction bearings that go into a 25" or 32" Axelson lathe—and there's a comparable number in the smaller models. There isn't a more accurate or trouble-free lathe on the market.

That's why Axelson Lathes are chosen first...to last!



AXELSON

HEAVY DUTY ENGINE LATHES . TOOL ROOM LATHES . GAP BED LATHES

AXELSON MANUFACTURING CO. . LOS ANGELES 58 . NEW YORK 7 . ST. LOUIS 16

Authorized Distributors in All Principal Industrial Centers

PIONEERS IN THE ART OF DESIGNING AND PRODUCING CARBIDE TOOLS A PRODUCT IS KNOWN BY THE COMPANY IT KEEPS WRIGHT X DIESEL CHEVROLET / TERPILLAR FORD mosten metninter WESSON COMPANY FERNDALE (DETROIT 20), MICH. Affiliated with WESSON METAL CORPORATION Carbiole Cutting Tools YOU'LL GET MORE WORK OUT OF WESSONMETAL AND **WESSON TOOLS**

Practical Assistance Whether it's a tight squeeze in a cookie Jar or a bottleneck on your production line . . . practical assistance—the kind that solves the problem simply and fast-is your best answer.

Cities Service Lubrication Engineers can offer practical assistance that will eliminate bottlenecks caused by faulty lubrication . . . will mean dollars, man-hours and equipment saved. They're specialists in the industry's most effective lubricating practices. In addition, they offer the most complete line of Cities Service quality lubricants.

but check for yourself:

Check on the high quality of all Cities Service lubricants. Ask critical users. Or better still, test them on the job.

Check the complete Cities Service line for the correct lubricant for every need.

Deliveries are quick—and dependable.

And finally, discuss your problems with a Cities Service Lubrication Engineer... he's probably solved many like them for other machine operations. Write or phone CITIES SERVICE OIL COMPANY, Dept. K18, Sixty Wall Tower, New York City 5... or get in touch with the office nearest you.

And PRACTICAL TECHNICAL ASSISTANCE is a

Cities Service specialty.



1/an Kourok

LARGE
AND
SMALL
MEASURING
WIRES

BIG ONES
LITTLE ONES
ANY SIZE
AT ALL

Perfect cylinders for all measuring purposes – Threads, Gears, Splines, Dovetails and Angles.

Complete specifications on Van Keuren Measuring Wires, and formulas for their use are given in the Van Keuren 1952 Catalog and Handbook No. 35.

THE PAN ROTTON

• Write for your copy

CO.

178 WALTHAM STREET, WATERTOWN, MASS.

33rd YEAR

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Cemented Carbide Plug Gages • Carboloy Cemented Carbide Measuring Wires

Product Directory

To find headings easily, look for capital letters at top of each page to denote locations.

ABRASIVE CLOTH, Paper and Belt

Carborundum Co., Buffalo Ave., Niagara Falis, N. Y. Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

ABRASIVE DISCS

See Discs, Abrasive.

ABRASIVES, Polishing, Tumbling, Etc.

Carborundum Co., Buffalo Ave., Niogara Falls, Carborunaum Co., Burraio Ave., Nogae N. Y. DoAll Co., 254 Laurel Ave., Des Plaines, Ill. Norton Co., 1 New Bond St., Worcester 6, Mass. Simonds Abrasive Co., Tacony and Fraley Sts., Bridesburg, Philadelphia, Pa.

ACCUMULATORS, Hydraulic

AIR HOISTS-See Hoists, Air.

AIR TOOLS-See Grinders, Pneumatic; Drills, Portable Pneumatic, Etc.

ALLOY STEELS

Allegheny Ludlum Steel Corp., Pittsburgh, Pa. Bethlehem Steel Co., Bethlehem, Pa. Carpenter Steel Co., Reading, Pa. Carpenter Steel Co., Reading, Pa. Crucible Steel Co. of America, Chrysler Bldg., New York 1, N. Y. Firth-Sterling Inc., McKeesport, Pa. Frasse, Peter A., & Co., Inc., 17 Grand St., New York 13, N. Y. Republic Steel Corp., Union Drawn Steel Div., Republic Bldg., Cleveland, Ohio. Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill. U. S. Steel Corp., Carnegie-Illinois Steel Corp. Div., 436 7th Ave., Pittsburgh, Pa. Wheelack, Lovejoy & Co., Inc., Cambridge, Mass.

ALLOYS, Aluminum

Aluminum Co. of America, Oliver Bldg., Pitts-burgh, Pa.

ALLOYS, Magnesium

Dow Chemical Co., Midland, Mich.

ALLOYS, Non-Ferrous

American Brass Co., 25 Broadway, New York.
Chase Brass & Copper Co., Inc., 1949 Rodney
St., Waterbury 20, Conn.
Haynes Stellite Div., Union Carbide & Carbon
Corp., 30 E. 42nd St., New York, N. Y.
Revere Copper & Brass Inc., 230 Park Ave.,
New York, N. Y.

ARBOR PRESSES

See Presses, Arbor.

ARBORS AND MANDRELS

Brown & Sharpe Mfg, Co., Providence, R. I.
Cleveland Twist Drill Co, 1242 E. 49th St.,
Cleveland, Ohio.
Danly Machine Specialties, Inc., 2107 S. 52nd
Ave., Chicago SO, III.
Frickson Tools Div. Erickson Steel Co., 2309
Hamilton, Cleveland, Ohio.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.

Gorton, George, Mch. Co., 1110 W. 13th St., Racine, Wis. Racine, Wis.
Jacobs Mfg. Co., West Hartford, Conn.
Kempsmith Machine Co., 1819 S. 71st St.,
Milwaukee 14, Wis.
Keo Cutters, 19326 Woodward, Detroit, Mich.
Morse Twist Drill & Mch. Co., New Bedford,
Marse

Keo Cufters, 19326 Woodward, Letron, Missi-Morse Twist Drill & Mch. Co., New Bedford, Mass. National Tool Co., 11200 Madison Ave., Cleve-land, Ohio. National Twist Drill & Tool Co., Rochester,

Mich.

Mich.

Pratt & Whitney, West Hartford 1, Conn.

Union Twist Drill Co., Athol, Mass.

Wesson Co., 1220 Woodward Heights Bivd.,

Ferndale, Mich.

Bunting Brass & Bronze Co., Spencer and Cari-ton Aves., Toledo, Ohio. Johnson Bronze Co., New Castle, Pa. Ryerson, Jos. T., & Son, 2558 W. 16th St., Chicago 18, III.

BALANCING EQUIPMENT

Anderson Bros. Mfg. Co., 1910 Kishwaukee St., Rockford, III, Gisholf Machine Co. (Static and Dynamic), 1245 E. Washington Ave., Madison 10, Wis. (Continued on page 280)



easy on easy off

the easy mounting mounting and removal system

pioneered by SKF

SKF.

BALL AND ROLLER BEARINGS

No designer today has to be sold on the advantages of anti-friction bearings. However they used to pose one serious problem to machine designers — that of the difficulty of mounting and removing interference fits, especially in bearings of comparatively large size. Not so today.

In the System of Hydraulic Removal, developed by BESF, OIL does the work. With simple equipment, you force oil between the shaft and the bearing, pressure breaks the fit, and the bearing slides off quickly, easily, safe from damage to bearing or housing. The same system eliminates the need for driving the tapered bore bearing on the shaft, or heating to obtain a shrink fit.

The accompanying illustrations show a few of the successful applications of this BOSP principle - on roll neck bearings in steel mills, printing cylinder and paper mill roll bearings, on BOSP

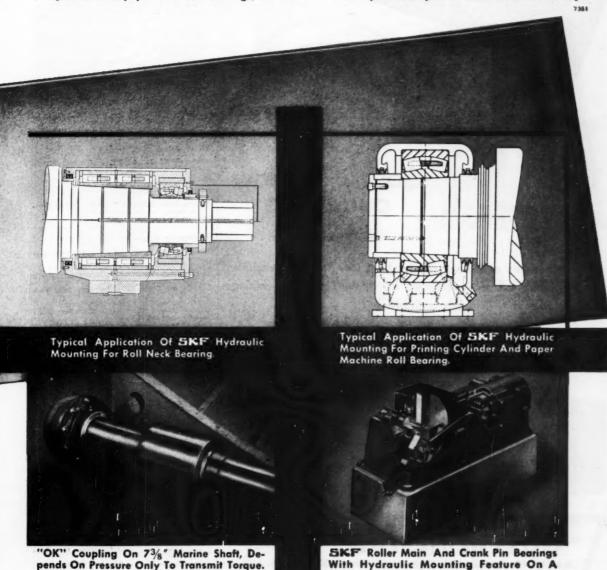
Separable By SKF Hydraulic System.

"OK" Shaft Couplings, main and crank pin bearings in air compressors. The principle is also well suited to other equipment such as crushers, construction machinery, etc.

mounting principle was made in 1943.

Since then, more and more equipment designers are taking advantage of this BSF "first." For further details, write for BSF Brochure No. 344.

SKF INDUSTRIES, INC., PHILADELPHIA 32, PA. - manufacturers of BKF and HESS-BRIGHT bearings.



Pneumatic Compressor.



GOSS and DE LEEUW CHUCKING MACHINE

When any of the various functions for which this machine is designed are performed on it, no further machining is required. The job is finished.

The basic "1-2-3" method-exclusive with Goss & De Leeuw -provides for gripping work in the chuck and machining all ends either simultaneously or in sequence. By elim-

inating several handlings and set-ups, the "1-2-3" method produces finished pieces at a fraction of the time and cost ordinarily required.

> GOSS & DELEEUW



Send samples of your work for time estimates. Ask for illustrated literature containing detailed infor-

GOSS and DELEEUW MACHINE COMPANY, KENSINGTON, CONN., U.S.A Morris Machine Tool Co., 9 Harriet St., Cincinnati 3, Ohio.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Pope Machinery Corp., Haverhill, Mass.
Snyder Tool & Engineering Co., 3400 E.
Lafayette, Detroit 7, Mich.
Sundstrand Mich. Tool Co., 2531 11th St.,
Rockford, Ill.

BALLS

Adamas Carbide Corp., 999 South 4th St., Harrison, N. J. Kennametal, Inc., Latrobe, Pa. S K F Industries, Inc., P. O. Box 6731, North Philadelphia, Pa.

BARS, Phosphor Bronze

Bunting Brass & Bronze Co., Spencer and Carl-ton Aves., Toledo, Ohio. Johnson Bronze Co., New Castle, Pa.

BARS, Steel

BARS, Steel

Allegheny Ludium Steel Corp., Pittsburgh, Pa. Bethlehem Steel Co., Bethlehem, Pa. Carpenter Steel Co., Reading, Po. Crucible Steel Co. of America, Chrysler Bidg., New York, N. Y.
Firth-Sterling Inc., McKeesport, Pa.
Frasse, Peter A., & Co., Inc., 17 Grand St., New York 13, N. Y.
LaSalle Steel Co., Hammond, Ind.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Republic Steel Corp., Union Drawn Steel Div., (Cold Drawn), Republic Bidg., Cleveland, Ohio.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Solar Steel Corp., Union Commerce Bidg., Cleveland, Ohio.
Timken Roller Bearing Co., Canton, Ohio.
U. S. Steel Corp., (American Steel & Wire Co. Div., Carnegle-Illinois Steel Corp. Div., Cofumbia Steel Co. Div., Tennessee Coal, Iron & R. R. Co. Div.), 436 7th Ave., Pittsburgh, Pa.
Wheelock, Loveloy & Co., Inc., Combridge.

BASES, Machinery Welded

Mahon, R. C., Co., 6565 E. 8 Mile Rd., Detroit 34, Mich.

burgh, Pa.
Wheelock, Lovejoy & Co., Inc., Combridge,
Moss.

BEARINGS, Bobbitt

Bunting Brass & Bronze Co., Spencer and Carl-ton Aves., Toledo, Ohio. Johnson Bronze Co., New Castle, Pa.

BEARINGS, Ball

Aetna Ball & Roller Bearing Co., 4612 Schubert Ave., Chicago, III.
Ball & Roller Bearing Co., Danbury, Conn.
Boston Gear Works, 3200 Main St., North Quincy, Mass.
C & C Sales Corp., 1771 Broadway, New York
19, N. Y.
Fafri Marlin-Rockwell Corp., 402 Chandler Bldg., Jamestown, N. Y. New Departure Div., General Motors, Bristol, Con. Nice Ball Bearing Co., Nicetown, Philadelphia, Pa. Norma-Hoffmann Bearings Corp, Stamford, Conn. S K F Industries, Inc., P. O. Box 6731, North Philadelphia, Pa. Torrington Co., Torrington, Conn.

BEARINGS, Bronze and Special Alloy

Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Johnson Bronze Co., New Castle, Pa.

BEARINGS, Lineshaft

Fafnir Bearing Co., New Britain, Conn.
Shafer Bearing Corp., Downers Grove, III.
S K F Industries, Inc., P. O. Box 6731, North
Philadelphia, Pa.
Orange Roller Bearing Co., Inc., Orange, N. J.
Standard Pressed Steel Co.,

BEARINGS, Needle

C & C Sales Corp., 1771 Broadway, New York 19, N. Y. Orange Roller Bearing Co., Inc., Orange, N. J. Torrington Co., Torrington, Conn. (Continued on page 282)

Double-duty filing at every stroke!

Only Heller NUCUT gives it to you





HELLER NUCUT WAVY FILE NUCUT TEETH FILE

WITH A NUCUT YOU FILE MORE, FASTER, BETTER WITH LESS EFFORT

NUCUT files are different. You can see the difference. Just hold the file at an angle—and you'll spot the exclusive wavy pattern made by NUCUT's two sets of teeth. It's this patented wavy construction that gives you superior cutting power.

The teeth do two jobs at every stroke. The coarse teeth cut fast, clean, without skidding.

The fine teeth leave the surface smooth. Just as if two files were working at every stroke,

See your distributor. He knows Nucurs, and will help you in selecting the right sizes, shapes and cuts.

HELLER BROTHERS COMPANY

A New Jersey Corporation
America's Oldest File Manufacturer
NEWCOMERSTOWN, OHIO

Select right file for job. Files come in many different sizes, shapes, cuts and types. So, make sure you select the right file for the job.

WRONG: Don't use a coarse file on fine work.



WRONG: Don't use a fine file on coarse, heavy work.



RIGHT: Fine work requires a fine file.



RIGHT: Coarse work should be handled with a coarse file.



Cash in on the file with the WHITE TANG E

N

E

D

CONTACT YOUR INDUSTRIAL DISTRIBUTOR for our FULL LINE of American Pattern, Swiss Pattern, Milled Curved-Tooth and Rotary Files, Rasps, Machinists' and Carpenters' Hammers, Blacksmiths' and Farriers' Tools, Bricklayers' and Plasterers' Trowels, Craftmaster Scrapers, Chisels, Punches, Mastereaches and other quality tools.

Never Be

SO MANY ADVANTAGES for HIGHEST PRODUCTION

4800 PER HOUR! 3800 PER HOUR! 2500 PER HOUR!



Air operated, electrically controlled Snow tools are establishing amazing production records daily on a wide variety of work. Just note these typical examples:

DRILLING

Crossdrill and C"T" Sink 1/16" Hole

Material-Brass Production-4800 per ho Fixture-#15 Vertical index Equipment - #1-UD Drilling Machine



TAPPING

Tap Two #10-32 Heles

Material—Steel stamping Production—3800 tapped holes per hour

Fixture-#14 horizontal index Equipment-#1-UT topping machine



THREADING

3/8"-24 Thread-1/2" Long Material-Die Cast Aluminum Production-2500 per hour Fixture—#10 Drum dial Equipment—#3-TR Threading

machine



Snow air operated—electrically controlled machines have built in full universal controls that allow selection of the type of spindle cycle desired. This feature also permits instant synchronization of the standard Snow Master Fixtion of the standard Snow Master Fix-hures. All types of air operated automatic and semi-automatic jigs and fixtures are carried in stock. Standardization permits low cost teoling—and—high production. Sensitivity of power application pre-vents tool breakage. Simplicity of control means that set up and operation can be handled by a less experienced operator with minimum fettigue.

Submit Sample Parts fo

MANUFACTURING COMPANY 435 Eastern Ave., Bellwood, Illinois (Chicago Suburb) Single Spindle Verticals • Two-Spindle Verti-Single spinale verticals - Iwo-spinale verti-cals - Two-Spindle Herizontals - Automatic Tapping Machines - Drill Press Tap Heads - Automatic & Sami-Automatic Jigs

BEARINGS, Roller

Aetna Ball & Roller Bearing Co., 4612 Schubert Ave., Chicago, III. Ball & Roller Bearing Co., Danbury, Conn. C & C Sales Corp., 1771 Broadway, New York Fafnir Bearing Co., New Britain, Conn. Hyatt Bearings Div., Harrison, N. J. Marlin-Rockwell Corp., 402 Chandler Bidg., Jamestown, N. Y. Norma-Hoffmann Bearings Corp., Stamford, Conn. Orange Roller Bearing Co., Inc., Orange, N. J. Conn.
Orange Roller Bearing Co., Inc., Orange, N. J.
Roilway Bearings Co., Inc., 541 Seymour St.,
Syracuse, N. Y.
Shofer Bearing Corp., Downers Grove, Ill.
S K F Industries, Inc., P. O. Box 6731, North
Philadelphia, Pa.
Timken Roller Bearing Co., Canton, Ohia.
Torrington Co., Torrington, Conn.

BEARINGS, Self-Lubricating (Oilless)

Bunting Brass & Bronze Co., Spencer and Carl-ton Aves., Toledo, Ohio. Johnson Bronze Co., New Castle, Pa.

BEARINGS, Topered Roller

C & C Sales Corp., 1771 Broadway, New York 19, N. Y. Timken Roller Bearing Co., Canton, Ohio. Torrington Co., Torrington, Conn.

BEARINGS, Thrust

Aetna Ball & Roller Bearing Co., 4612 Schubert Ave., Chicago, III.
Bail & Roller Bearing Co., Danbury, Conn.
Boston Gear Works, 3200 Main St., North Quincy, Mass.
Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Fafriir Bearing Co., New Britain, Conn.
General Electric Co., Schenectady, N. Y.
Marlin-Rockwell Corp., 402 Chandler Bidg., Jamestown, N. Y.
Nice Ball Bearing Co., Nicetown, Philadelphia, Pa. Nice Ball Bearing Co., Fraceson, Pa.
Pa.
Norma-Hoffmann Bearings Corp., Stamford, Conn.,
Orange Roller Bearing Co., Inc., Orange, N. J.
Shafer Bearing Corp., Downers Grove, III.
Timken Roller Bearing Co., Canton, Ohio.
Torrington Co., Torrington, Conn.

BELT FASTENERS, Metal, Leather, Etc.

Bristol Co., Platts Mills, Waterbury, Conn.

BELT SHIFTERS

Standard Pressed Steel Co., Jenkintown, Pa.

BELTING TRANSMISSION

Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.

BENCHES, Work, and Bench Legs

Standard Pressed Steel Co., Jenkintown, Pa.

BENDING MACHINES, Angle Iron, Plate, Etc.

Consolidated Mch. Tool Corp., 565 Blossom Rd., Rochester, N. Y. Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, III.
Kling Bros. Engineering Works, 1320 No.
Kostner Ave., Chicago 51, III.
O'Neil-Irwin Mfg. Co., Lake City, Minn.
Struthers Wells Corp., Machinery Div., Titusville, Pa.

BENDING MACHINES, Hydraulic

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio. aldwin-Lima-Hamilton Corp., Philadelphia 42, Onio.
Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Buffalo, Forge Co., 490 Broadway, Buffalo, N. Y. Chambersburg Engrg. Co., Chambersburg, Pa. Farquhar, A. B., & Co., 21 Duke St., York, Pa. Hannifin Corp, 1101 S. Kilbourn Ave., Chicago, III. HII.

Hydraulic Press Mfg. Co., 300 Lincoln Ave.,
Mt. Gilead, Ohio.

Lake Erie Engrg. Corp., Kenmare Sta., Buffalo,
N. Y.

Morgan Engineering Co., Alliance, Ohio. (Continued on page 284)

Sowe Time-Prevent Worstewith FEDERAL Gaging Systems



AIR GAGES FEDERAL DIMENSIONAIR:

- Greatest measuring range of all .003" with 2500 to 1 magnification.
- Full 7½" calibrated scale shows how much size is out accurately.
- · Indicates earlier when approaching size.
- · Shows inaccuracies positively.
- Use same gage on rough and finish work.
- Gets into small or irregular holes.
- Easy to set.



CONTINUOUS MEASURING GAGES

Glass tubing, bare wire, insulated wire, steel rods, sheet, and similar continuous material is gaged and size-controlled or chart-recorded—cut sections sorted according to requirements—all automatically. Gages for controlling grinders and other production machines.



AUTOMATIC SORTING GAGES

High speed, completely automatic from machine to package. Semi-automatic or hand fed. Inspect multiple dimensions. Anything from ¼" diam, balls to—what's your sorting problem?



FEDERAL

FEDERAL PRODUCTS CORPORATION . 1111 EDDY STREET . PROVIDENCE 1, R. I.

UW, DUMORE DRILL HEAD makes every drill operator

an expert!

THE new Dumore Automatic Drill Head does away with operator guesswork the new resistance drilling way. High drill breakage losses are virtually eliminated by this remarkable new tool. It produces pre-mum quality, small diameter data, below mium quality, small diameter deep holes, even with unskilled labor. And shop foremen report average drill life increases as much as 93 per cent.

Dumore's new resistance drilling automatically equalizes the exact pressure required for every stroke of the drill head . . . automatically compensates for variations in drill quality and workpiece hardness . . . factors your drill operators can't compensate for by sense of touch alone.

Depend on Dumore Automatic Drill Heads - and get big savings in drill costs, quality workmanship plus production increases.

Get all of the advantages of this remarkable shop tool. Ask your nearby industrial distributor for a demonstration, or write the Dumore Company.



Holes for airplane parts are produced 12 times faster at a 97% cost reduction with this setup. In fact, the Dumore Drill Head paid for itself after only 4½ hours operation.

THE DUMORE COMPANY

1343 Seventeenth Street • Racine, Wisconsin

Niagara Machine & Tool Works, 683 Northland Ave., Buffolo, N. Y. O'Neil-Invrin Mfg. Co., Lake City, Minn. Struthers Wells Corp., Machinery Div., Titus-ville, Pa. Watson-Stillman Co., Roselle, N. J.

BENDING MACHINES, Pipe

Buffalo Forge Co., 490 Broadway, Buffalo. Farquhar, A. B., & Co., 21 Duke St., York, Pa. O'Neil-Irwin Mfg. Co., Lake City, Minn. Watson-Stillman Co., Roselle, N. J.

BLAST CLEANING EQUIPMENT

Leiman Bros., Inc., 156 Christie St., Newark, N. J. Pangborn Corp., Hagerstown, Md. Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

BLOWERS

Buffalo Forge Co., 490 Broadway, Buffalo, N. Y. Ingersoil-Rand Co., Phillipsburg, N. J. Leiman Bros., Inc., 156 Christie St., Newark, N. J. Standard Electrical Tool Co., 2488-90 River Rd.. Cincinnati 4, Ohio.

BOILER TUBES

Bethlehem Steel Co., Bethlehem, Pa.
Republic Steel Corp., Steel and Tubes Div.,
Republic Bldg., Cleveland 1, Ohio.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th
St., Chicago 18, III.
U. S. Steel Corp., National Tube Co., Div.,
436 7th Ave., Pittsburgh, Pa.

BOLT AND NUT MACHINERY

Ajax Mfg. Co., Euclid, Cleveland 17, Ohio. Hill Acme Co., 1201 W. 65th St., Cleveland 2. Hill Acme Co., 1201 W. 65th St., Cieverand 2. Ohio. Landis Machine Co., Inc., Waynesboro, Pa. National Machinery Co., Tiffin, Ohio. New Britain Machine Co., New Britain-Gridley Mch. Div., New Britain, Conn.

BOLTS AND NUTS

Aluminum Co. of America, Oliver Bldg., Pitts-Aluminum Co. of America, Oliver Bldg., Pitts-burgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Erie Bolt & Nut Co., Erie, Pa.
Notional Acme Co., 170 E. 131st St., Cleve-land, Ohio.
Northwestern Tool & Engrg. Co., 117 Hollier, Dayton, Ohio.
Ottemiller, W. H., & Co., York, Pa.
Republic Steel Corp., Bolt & Nut Div., Republic Bldg., Cleveland I, Ohio.
Russell, Burdsall & Ward Bolt & Nut Co., 100 Midland Ave., Port Chester, N. Y.

BOLTS, T-Slot

Standard Shop Equipment Co., Inc., 8299 W. Tinicum Ave., Philadelphia, Pa.

BOOKS, Technical

Industrial Press, 148 Lafayette St., New York 13, N. Y. Lincoln Electric Co., 22801 St. Clair Ave., Cleveland, Ohio.

BORING AND DRILLING MACHINES

Baker Bros., Inc., Sta. F, P. O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Canedy-Otto Div. Cincinnati Lathe & Tool Co., Oakley, Cincinnati, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Foote-Burt Co., 1300 St. Clair Ave., Cleveland 8, Ohio. Foote-Burt Co., 1300 St. Clair Ave., Cleveland 8, Ohio.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, III.
Morline Tool Co., 102 20th St., Moline, III.
Morris Machine Tool Co., 9 Harriet St., Cincinnati 3, Ohio.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Rogers Machine Works, Inc., Buffalo 10, N. Y.
Snyder Tool & Engineering Co., 3400 E.
Lařayette, Detroit 7, Mich.
Turner Bros., Inc., 265 Hilton Rd., Ferndale 20, Mich.
Wales-Strippit Corp., North Tonawanda, N. Y.
(Continued on page 286)

(Continued on page 286)

DANLY SPECIAL DIE SETS





help Mask meet close production schedules!

Dies play a big part in modern high-speed automobile production. They have to be ready on time when model changes are scheduled and they have to stand up under three-shift operation day in and day out with a minimum of down time. That's why you'll find so many Nash production dies built in Danly Special Die Sets. A Danly set means fast delivery to meet the tooling schedule and a rugged, precise base for the dies that assures maximum die life.

DANLY MACHINE SPECIALTIES, INC.

2100 South Laramie Avenue · Chicago 50, Illinois

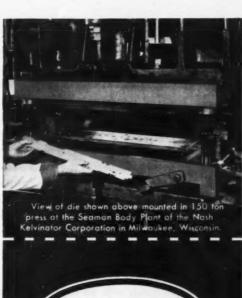
DANLY SPECIAL DIE SET SERVICE IS FAST AND CONVENIENT
—CALL YOUR NEAREST DANLY BRANCH

*CHICAGO 50____2100 South Laramie Avenue *CLEVELAND 14_ ... 1550 East 33rd Street *DAYTON 7_ 3196 Delphos Avenue 1549 Temple Avenue *DETROIT 16____ *GRAND RAPIDS _____113 Michigan Street N.W. 5 West 10th Street INDIANAPOLIS 4 *LONG ISLAND CITY 1___ _47-28 37th Street *LOS ANGELES 54 Ducommun Metals & Supply Co., 4890 South Alameda MILWAUKEE 2____111 East Wisconsin Avenue *PHILADELPHIA 40_____511 W. Courtland Street

*ROCHESTER 6_

*Indicates complete stack

_33 Rutter Street





DIE SETS ... STANDARD OR SPECIAL DIEMAKERS' SUPPLIES



Maintain the precision and accuracy of the drills in your toolroom. Avoid costly production slowdowns. Those due to excessive drill costs and imperfect holes can easily be traced to improper grinding of the drill points. It is a proved and generally accepted fact that machine grinding is the most accurate method for restoring efficiency to drills. Oliver Drill Pointers give balanced cut, with each lip doing equal work. Drills will cut faster, last longer and produce more accurate holes when machine ground on Oliver Drill Pointers.

No. 510 for drills 1/4" to 3"-2-3-4 flute. Variable clearances Variable point angles. Full automatic operation.

No. 21 Oliver Bench Drill Grinder. Hand operated for Drills No. 57 to $\frac{1}{2}$ ". Right hand, with an improved point. Attachments are available for grinding oil hole drills, left hand and other special points.

Write for our free Booklet "How To Produce More Holes With Your Drillst"

OLIVER INSTRUMENT

1410 E. MAUMEE . ADRIAN, MICHIGAN

BORING AND TURNING MILLS, Vertical

American Steel Foundries, King Mch. Tool Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio. Bullard Co., Brewster St., Bridgeport 2, Conn. Cosa Corp., 405 Lexington Ave., New York 17 N. Y. N. Y. Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich. Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Rogers Machine Works, Inc., Buffalo 10, N. Y.
Snyder Tool & Engineering Co., 3400 E.
Lafayette, Detroit 7, Mich.

BORING BARS

BORING BARS

Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.

Apex Tool & Cutter Co., Inc., 237 Canol St., Shelton, Conn.

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.

Bullard Co., Brewster St., Bridgeport 2, Conn.

Bunell Machine & Tool Co., 1600 East 24th St., Cleveland 14, Ohio.

Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Datroit 32, Mich.

Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.

Erickson Tools Div., Erickson Steel Co., 2309 Hamilton, Cleveland, Ohio.

Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.

Firth-Sterling Inc., McKeesport, Po., Rockford, Ill.

Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo. Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo. Lovejoy Tool Co., Inc., Springfield, Vt. McCrosky Tool Carp., 1938 Thomas St., Meadville, Pa., Madison Mfg. Co., Muskegon Heights, Mich. Neise, Karl A., Dept. M., 381 Fourth Ave., New York 16, N. Y. Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohlo. Williams, J. H., & Co., 400 Vulcan St., Buffolo 7, N. Y.

BORING, DRILLING AND MILLING MACHINES, Horizontal

(Floor, Planer or Table Types)

Cincinnati Gilbert Machine Tool Co., 3366
Beekman St., Cincinnati 83, Ohio.
Espen-Lucas Machine Works, Front St. and
Girard Ave., Philadelphio, Pa.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit
32, Mich.
Giddings & Lewis Mch. Tool Co., Fond du Loc. Wis.
Gray, G. A., Co., Woodburn Ave. and Penn R. R., Evanston, Cincinnati, Ohio.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Lucas Mch. Tool Div., New Britain Mch. Co., 12302 Kirby Ave., Cleveland 8, Ohio.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Portage Machine Co., 1069 Sweitzer Ave., Akron 11, Ohio.
Snyder Tool & Engineering Co., 3400 E.
Lafayette, Detroit 7, Mich.
Turner Bros., Inc., 2625 Hilton Rd., Ferndale 20, Mich.

BORING HEADS

Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.
Chandler Tool Co., 514 Ohio Ave., Muncie, Ind. Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis. Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa. McCrosky Tool Corp., 1938 Thomas St., Mead-ville, Pa.

Mummert-Dixon Co., Hanover, Pa.

Neise, Karl A., Dept. M., 381 Fourth Ave., New York 16, N. Y.

Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

BORING MACHINES

Chandler Tool Co., 514 Ohio Ave., Muncie, Ind. Ex-Cell-O Corp., 1200 Oakman Blyd., Detroit 32, Mich. Heald Machine Co., 10 New Bond St., Wor-Heald Machine Co., 10 New Bond St., Wor-cester 6, Mass. National Automatic Tool Co., Inc., S. 7th and N Sts., Richmond, Ind. New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.



SWISS BLUE RIBBON PRECISION MACHINE TOOLS

Backed right
here in the U.S.
by skilled
technicians,
factory service
and quarantee,
and spare parts
readily available
from every
Hirschmann
Branch.

Typical as to precision and as to fame of trade name, Tornos R10 Swiss Automatic Screw Machine.

CONDENSED SUMMARY OF PRODUCTS

JIG GRINDERS LAPPING MACHINES LATHES High Production • Rapid Copying Toolmakers' . Turret & Repitition MILLING MACHINES Cam • Production • Surface • Toolmakers' PANTOGRAPHS POLISHING MACHINES PRESSES Automatic for Bolt & Nut Industry Bench . Cam . Die . Heavy Duty Hot & Cold . Shaving SCREW MACHINES Swiss Automatic SHAPER Short Stroke . Copying SPECIAL AUTOMATICS For Watchmaking and similar industries THREAD CHASING MACHINES Semi-Automatic
THREAD CUTTING MACHINES THREAD ROLLING MACHINES TOOLS Screw Machine-Carbide and High Speed Steel
TURNING MACHINES

Semi-Automatic

BLUE RIBBON List of Trade Names

Agathon Bartsch Burri Chappuis Diametal Ebosa Esco Essa Hauser Hommel Huller Kellenberger Kummer Lambert Lienhard Manurhin Meteor Mipsa Nassovia Safag Schaublin Technica Thommen **Tornos Tripet Exclusively Represented**

in the United States by Carl Hirschmann Co. 30 Park Ave., Manhasset, N. Y.

BAND SAW & FILING MACHINES CAM-MAKING EQUIPMENT CHECKING & MEASURING INSTRUMENTS Horizontal Micrometers • Optical

Horizontal Micrometers • Optical Vertical Micrometers CHUCKS
Keyless Driil
DIAMOND & OTHER ABRASIVE WHEELS DIE SETS
DIE SINKERS
DRILLING & TAPPING MACHINES FINISHING MACHINES

Precision
FORMING & CUTTING-OFF MACHINES
Automatic
GEAR HOBBING MACHINES

GRINDERS
Tool • Twist Drill
GRINDING MACHINES
Hydraulic • Hydraulic Cylindrical
Jig • Optical • Universal

Universal

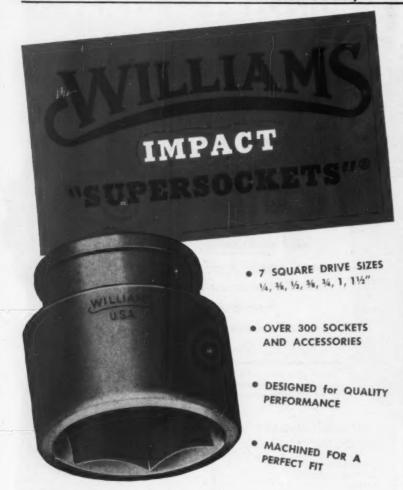
JIG BORERS



HRSCHMANN

MANHASSET · CHICAGO · CLEVELAND · DETROIT · LOS ANGELES · MILWAUKEE

Representatives in Principal Cities



Can be used with ALL TYPES of **Power Wrenches and Nut Runners**

Williams IMPACT "Supersockets" are being used effectively on both air driven and electric tools... even can be used with Williams hand socket drivers.

Add to this the designed-in durability of extra-tough fully heat-treated steel that withstands pounding and shock long after ordinary types are scrapped.

Then consider the advantages of meeting your individual requirements with the right Williams IMPACT "Supersockets" stocked locally by your industrial distributor.

Reason enough why Williams IMPACT "Supersockets" are first choice of concerns known for their production efficiency.

Get The Pacts . . . Write us for detailed, illustrated catalog A-100. Ask your Williams Distributor for a demonstration.

J. H. WILLIAMS & CO., 416 Vulcan St., Buffalo 7, N. Y. DROP-FORGINGS AND DROP-FORGED TOOLS



Williams Impact "Supersockets"® are sold through your Distributor who knows and can supply your needs promptly - correctly.

BORING MACHINES, Jie

American Sip Corp., 100 E. 42nd St., New York American Sip Corp., 100 E. 42nd St., New York 17, N. Y.
Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati Ohlo.
Cleereman Mch. Tool Co., Green Bay, Wis.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
De Vileg Machine Co., 450 Fair Ave., Ferndale, Detroit 20, Mich.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Kearney & Trecker Corp., Milwaukee, Wis.
Moore Special Tool Co., Inc., 724 Union Ave., Bridgeport, Conn.
Orbon, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Triplex Machine Tool Corp., 125 Barclay St., New York, N. Y.
Wales-Strippit Corp., North Tonawanda, N. Y.

BORING TOOLS

BORING TOOLS

Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.,
American Steel Foundries, King Mch. Tool Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohlo.

Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Atrax Co., Newington, Conn.
Burlell Machine & Tool Co., 1600 East 24th St., Cleveland 14, Ohio.
Carboloy Dept., General Electric Co., Box 237.
Roosevelt Park Annex, Detroit 32, Mich.
Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth-Sterling Inc., McKeesport, Pa.
Giddings & Lewis Mch. Tool Co., Fond du Lac, Wis.
Giddings & Lewis Mch. Tool Co., Fond du Lac, Wis.
Gorham Tool Co., 14400 Woodrow Wilson, De-Gorham Tool Co., 14400 Woodrow Wilson, De-Wis.

Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.

Havnes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.

Kennametal, Inc., Latrobe, Pa.
Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.
Lovejoy Tool Co., Inc., Springfield, Vt.

Madison Mg. Co., Muskegon Heights, Mich.

McCrosky Tool Carp., 1938 Thomas St., Meadville, Po.

Metal Carbides Carp., Youngstown, Ohio.

Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich. Metal Cui Co., 21650 nov...
Mich.
Union Twist Drill Co., Athol, Mass.
Warner & Swasey Co., 5701 Carnegie Ave.,
Cleveland 3, Ohio.
Wesson Co., 1220 Woodward Heights Blvd.,
Ferndale, Mich.
Williams, J. H., & Co., 400 Vulcan St., Buffalo
7, N. Y.

BRAKES, Press and Bending

BRAKES, Press and Bending

Bath, Cyril, Co., 6984 Machinery Ave., Cleveland 3, Ohio.

Bliss, E. W., Co., 1375 Raff Road, S. W., Canton, Ohio.

Cincinnati Shaper Co., Elam and Garrard Aves., Clicinnati, Ohio.

Cleveland Crane & Engra. Co., Wickliffe, Ohio.

Columbia Machinery & Engineering Corp., Hamilton 1, Ohio.

Dreis & Krump Mfg. Co., 7416 Loomis Blvd., Chicago 36, Ill.

Ferracute Machine Co., Bridgeton, N. J.

Verson Allsteel Press Co., 93rd St. and S. Kenwood Ave., Chicago, Ill.

Watson-Stillman Co., Roselle, N. J.

BROACHES

American Broach & Mch. Co., Ann Arbor, Mich. Carboloy Dept., General Electric Co., Box 237 Roosevelt Park Annex, Detroit 32, Mich. Colonial Broach Co., P. O. Box 37, Harper Sta., Detroit Broach Co., 20201 Sherwood Ave., Detroit, Mich. Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich. Lapointe Mch. Tl. Co., Tower St., Hudson, Mass. National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich. Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich. Zogar Tool, Inc., 24000 Lokeland Blvd., Cleveland 23, Ohio.

BROACHING MACHINES

American Broach & Mch. Co., Ann Arbor, Mich. Cincinnati Milling Mch. Co., Cincinnati, Ohio. (Continued on page 290)



Veteran machinist George Thomas really has things humming at the Chattanooga plant of Combustion Engineering-Superheater, Inc. At the time this new KING was installed, output from two other boring mills was running far behind schedule. But under "Pop's" skilled hand, this new 72" KING is producing more work than the former output of the other two mills combined.

The combination of George Thomas' long experience and KING'S modern design has made possible tremendous cuts in job floor-to-floor time. Take, for example, the work illustrated in the photograph above. The KING is shown

machining an 81'' dia. x 33'' deep steel boiler drum head having $4\,\%''$ wall thickness. Operations include turning, boring and facing. Previous machining time was 25 hours. Time with the new KING is 10 hours.

This experience with a New-Series KING Vertical Boring and Turning Machine at one of the nation's leading industrial plants is not unique. It is typical of KING performance in hundreds of other plants engaged in defense and civilian production. KING Mills are made in 10 sizes: 30", 36", 42", 52", 62", 72", 84", 100", 120" and 144". Available in a variety of head combinations.

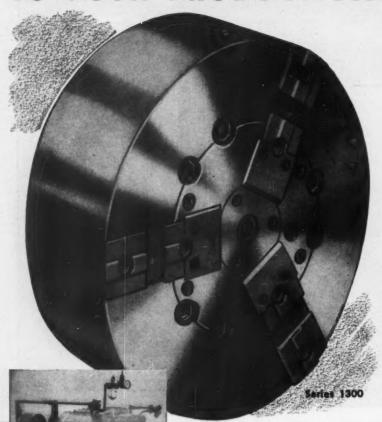
American Steel Foundries

KING MACHINE TOOL DIVISION

CINCINNATI 29, OHIO

SKINNER CHUCKS

PUSH PRODUCTION!



Write for catalog giving complete details on the Skinner line of power and manually operated chucks. And ask about new movie "Chucks and Their Usee" — available for free showings.



THE CREST OF QUALITY

CHUCK CO. Connecticut

The Skinner line of power chucks and power chucking equipment has the strength, rigidity and design features so essential for today's production needs Chucks are available from 6" to 21" with forged steel bodies, and with either 2 or 3 adjustable or non-adjustable jaws. Exclusive sliding wedge construction grips internal or external work positively regardless of jaw position. The chuck will not release the work, even if air line is broken, until operator actuates the draw bar. Skinner double acting rotating and non-rotating air cylinders are available for all sizes of Skinner power chucks, and for actuating all types of holding fixtures and tailstocks. Other Skinner accessories include hand operating valves -complete air unit including regulating valve, pressure gage and lubricator-342 Church Street, New Britain filters — soft blank top jaws; draw bars draw tubes, etc.

Colonial Broach Co., P. O. Box 37, Harper Sta., Detroit, Mich.
Consolidated Mch. Tool Corp., Rochester, N. Y. Foote-Burt Co., 1300 St. Clair Ave., Cleveland 8, Ohio.
Lapointe Mch Tl. Co., Tower St., Hudson, Mass. National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
Wilson. K. R., 215 Main St., Buffalo, N. Y. Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

BRONZE

American Brass Co., Waterbury 20, Conn. Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Chase Brass & Copper Co., Inc., 1949 Rodney St., Waterbury 20, Conn.
Johnson Bronze Co., New Castle, Pa.

BRUSHES, Industrial, Wire Wheel, Etc.

Osborn Mfg. Co., \$401 Hamilton Ave., Cleve-land, Ohio. Pittsburgh Plate Glass Co., Brush Div., 3221 Frederick Ave., Baltimore, Md.

Black & Decker Mfg. Co., E. Penna. Ave., Towson, Md. (Partable Elec.).
Delta Power Tool Div., Rockweil Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa. Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.
Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich. Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.

BULLDOZERS

Ajax Mfg. Co., Euclid, Cleveland 17, Ohio.
American Steel Foundries, Elmes Engrg. Div.,
Paddack Rd. and Tennessee Ave., Cincinnati,
Ohio.
Atrax Co., Newington, Conn.
Baldwin-Lima-Hamilton Corp., Philadelphia 42,
Pa.
Chambersburg Engrg. Co., Chambersburg, Pa.
Hufford Machine Works, Inc., 1700 E. Grand
Ave., El Segundo, Callif.
Kling Bros. Engineering Works, 1320 No.
Kostner Ave., Chicago 51, Ill.
Lake Erie Engineering Corp., Kenmore Station,
Buffolo, N. Y.
Watson-Stillman Co., Roselle, N. J.

BURS

See Files and Burs, Rotary.

BUSHINGS, Brass, Branze, Carbide, Etc.

Adamas Carbide Corp., 999 South 4th St., Harrison N. J.
Boston Gear Works, 3200 Main St., North Quincy, Mass.
Bunting Brass & Branze Co., Spencer and Carl-ton Aves., Toledo, Ohio.
Havnes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York. Johnson Branze Co., New Castle, Pa. Kennametal, Inc., Latrobe, Pa.

BUSHINGS, Hardened

Danly Machine Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, III. Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32. Mich. Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass. U. S. Steel Co., Inc., 436 7th Ave., Pittsburgh,

BUSHINGS, Jig

Colonial Bushings, Inc., P. O. Box 37, Harper Sta.. Detroit, Mich. Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich. Meyers, W. F., Co., Bedford, Ind. Universal Engrg. Co., Frankenmuth, Mich.

CABINETS, Tool

Armstrong Bres. Tool Co., 5200 W. Armstrong Ave., Chicago, III.

CALIPERS

Ames, B. C., & Co. (Dial), Waltham 54, Mass. Brown & Sharpe Mfg. Co., Providence, R. I. Homestrand, Inc., Larchmont, N. Y. Inter-Continental Trading Corp., 90 West St., New York 6, N. Y.

(Continued on page 292)

IN ALL INDUSTRIES

LUBRIPLATE LUBRICANTS

EXCEL IN REDUCING FRICTION, WEAR, UPKEEP-COSTS AND POWER-CONSUMPTION...WITH BETTER MACHINE PERFORMANCE

"THIS LUBRICANT CUT OUR PARTS REPLACEMENT 50%"

- says NORTHERN PACIFIC TRANSPORTATION COMPANY



"LUBRIPLATE proved so satisfactory during tests that we installed it in all our worm-gear, hypoid, and two speed axles. This enabled us to change our oil-change period from 15,000 miles to 40,000 and on some applications, depending on speeds and temperatures encountered, we raised the change period to 60,000 miles, or approximately once a year. Our overhaul periods were stretched from 50,000 to 100,000 miles, and repair parts bill cut 50% with the increased mileage."



THE GLOBE COMPANY says:
"THIS LUBRICANT
INCREASED BEARING
LIFE FROM 2 WEEKS

TO 2 YEARS"

"After we had quite a few of our large high speed ROTO-CUT meat cutting machines in actual production operation, the ball and spherical roller bearings on the cutter shaft gave us serious trouble due to a condition that prevails throughout the meat packing industry, animal acids and moisture. Some bearings did not last even two weeks. Then, BALL BEARING LUBRIPLATE was called to our attention. The result: these machines lubricated with BALL BEARING LUBRIPLATE have been in continuous operation for over two years without a single bearing replacement.

The Globe Company Frank J. Bilek (Chief Engineer) "THIS LUBRICANT kept 'em rolling in mud, muck and water"

- says J. O. ARCHIBALD of Redwood City, California



"Due to our success on similar work, The Leslie Salt Company gave us the contract for the conversion of 500 acres of salt marsh into crystallizing ponds. Knowing from experience that LUBRI-PLATE No. 107 reduced friction to a minimum, and prevented rust even in salt water, we adopted it for track and general lubrication. We selected LUBRI-PLATE APG-140 for all transmissions and final drives. The effectiveness of LUBRIPLATE is evidenced by the fact that during the entire job there were no replacements of track rollers nor were there any tie-ups of equipment due to replacement or breakage."

J. O. Archibald



MACHINERY LUBRIPLATE LUBRICANTS
IMPROVE OPERATION AND GREATLY REDUCE
MAINTENANCE COSTS.

Write today for LUBRIPLATE Data Book No. 1-52

LUBRIPLATE DIVISION

Fiske Brothers Refining Co. Newark 5, N. J. Toledo 5, Ohio

DEALERS FROM COAST TO COAST-SEE YOUR CLASSIFIED TELEPHONE BOOK



HE'S HAVING FUN! HIS SPLINE GAGING TROUBLES ARE ENDED.

The failure of splined parts to assemble properly or to interchange, and the resulting high rate of scrap had been a constant worry for many months. So he called on Vinco. A careful check was made of how splined parts were designed, manufactured and gaged, then design improvements and a practical and efficient gaging program were recommended. This program was accepted. Now his splined parts are interchangeable, meet all specifications and scrap is at a minimum. We can do the same for you.

> VINCO CORPORATION 9111 Schaefer Hwy. Detroit 28, Mich.

The finest involute, serration and straight sided spline plug and ring gages.



TRADEMARK OF DEPENDABILITY

OPTICAL MASTER INSPECTION DIVIDING HEAD

INVOLUTE CHECKER

MASTER GEARS

FORMED WHEEL DRESSERS

PRECISIONDEX

AIRCRAFT and COMMERCIAL GEARS

ENGINEERING SERVICE FOR **ABOVE PRODUCTS**

Millers Falls Co., Greenfield, Mass.
Neise, Karl A., Dept. M., 381 Fourth Ave.,
New York 16, N. Y.
Scherr, George, Co., Inc., 200 Lafayette St.,
New York 12, N. Y.
Starrett, The L. S., Co., Athol, Mass.

CAM CUTTING MACHINES

Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Fellows Gear Shaper Co., Springfield, Vt.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, III.

CAM MILLING AND GRINDING MACHINES

Hirschmann, Carl, Co., 30 Park Ave., Man-hasset, N. Y. Landis Tool Co., Waynesboro, Pa. Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y. Rowbottom Machine Co., Sheffield St., Water-ville, Waterbury, Conn.

CAMS

Eisler Engrg. Co., Inc., 760 S. 13th, Newark 3, N. J.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Kux Mch. Co., 3930 W. Harrison St., Chicago, III.
Rowbottom Machine Co., Sheffield St., Waterville, Waterbury, Conn.
Vinco Corp., 8855 Schaefer Highway, Detroit 27, Mich.

CARBIDES, TANTALUM, TITANIUM AND TUNGSTEN

Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.
Allegheny Ludlum Steel Corp., Pittsburgh, Pa. Corboloy Dept., General Electric Co., Box 237, Rooseveit Park Annex, Detroit 32, Mich. Firth-Sterling Inc., McKeesport, Pa. Kennametal, Inc., Latrobe, Pa. Metal Carbides Corp., Youngstown, Ohio. Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

CASEHARDENING FURNACES

See Furnaces, Heat-Treating.

CASTINGS, Aluminum, Brass, Bronze, Magnesium, Etc.

Aluminum Co. of America, Oliver Bldg., Pittsburgh, Pa. of America, onver sings, Piris-burgh, Pa. Bethlehem, Pa. Bethlehem, Pa. Bunting Brass & Bronze Co., Spencer and Carl-ton Aves., Toledo, Ohio.

CASTINGS, Die

Aluminum Co. of America, Oliver Bldg., Pitts-burgh, Pa. American Brass Co., Waterbury 20, Conn. Madison-Kipp Corp., Madison, Wis.

CASTINGS, Iron

Bethlehem Steel Co., Bethlehem, Pa. Brown & Sharpe Mfg. Co., Providence, R. I. Chambersburg Engineering Co., Chambersburg,

CASTINGS, Steel, Alloys, Etc.

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Birdsboro Steel Fdry. & Mch. Co., Birdsboro, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon
Corp., 30 E. 42nd St., New York.
U. S. Steel Corp., Columbia Steel Co., Div.,
436 7th Ave., Pittsburgh, Pa.

CEMENT, Disc Grinding Wheel

Besly-Welles Corp., Beloit, Wis. Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

(Continued on page 294)

FROM ROSAVIO to Rochester INDUSTRY depends on Illinois GEARS...

HERE is a spur gear of 72" pitch diameter, weighing 3000 lbs, one of hundreds we have supplied to packing plants throughout the entire Western Hemisphere. These and thousands of other plants, no matter how far from "home," have learned they can depend on "Illinois Gear" for quality economy...prompt delivery

CHICAGO USA

Gears for Every Turpose ... one gear or 10,000 or more ILLINOIS GEAR & MACHINE COMPANY



You get / UPSET FLANGE CABINET BENDING



NGENT RE

With a horn-type die, permitting the operator to make a complete wrap-around cabinet with upset flanges in two machine operations, this popular Tangent Bender Model 12 DW 2 is ideal for the low-cost production of small cabinets and cases. Exact duplication of parts is assured, with production up to 90 pieces per hour for complete wrap-aroundsup to 200 per hour for U-shape pieces. Write for details!



A COMPLETE LINE: Struthers Wells builds an integrated line of modern machinery for sheet metal forming. Full details on our Tangent Benders, Folding Machines, Roller Table Bending Machines, Sheet Stretch Benders, Tumble Die Bending Machines, and Press Brakes gladly supplied on request.

MACHINERY DIVISION

STRUTHERS WELLS CORPORATION TITUSVILLE, PA.

Offices in Principal Cities

CENTERING MACHINES

Consolidated Mch. Tool Corp., Rochester, N. Y. Espen-Lucas Machine Works, Front St. and Girard Ave., Philadelphia, Pa. Ex-Celi-O Corp., 1200 Oakman Blvd., Detroit 32, Mich. Jones & Lamson Mch. Co., Springfield, Vt. Seneca Falls Mch. Co., Seneca Falls, N. Y. Snyder Tool & Engineering Co., 3400 E. Lafayette, Detroit 7, Mich. Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.

CENTERS, Lathe

Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich. Firth-Sterling Inc., McKeesport, Pa. Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich. Hoynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York. Houston Grinding & Mrg. Co., 2110 Quitman St., Houston Io, Tex. Kennametol, Inc., Latrobe, Pa. Metal Carbides Corp., Youngstown, Ohio. Morse Twist Drill & Mch. Co., New Bedford, Mass. Mosse (wist on the control of the co

CHAINS, Power Transmission and

Boston Gear Works, 3200 Main St., North Quincy, Mass. Ohio Gear Co., 1333 E. 179th St., Cleveland, Ohio. Ohio. Philadelphia Gear Works, Erie Ave. and G St., Philadelphia, Pa.

CHISELS AND CHISEL BLANKS

Bethlehem Steel Co., Bethlehem, Pa. Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.

CHUCKING MACHINES

CHUCKING MACHINES

Bardons & Oliver, Inc., Ft. W. 9th St., Cleveland 13, Ohio.

Bullard Co., Brewster St., Bridgeport 2, Conn.
Cleveland Automatic Machine Co., 4932 Beech St., Cincinnati 12, Ohio.
Gisholf Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Coss & DeLeeuw Mch. Co. (Multiple Spindle), Kensington, Conn.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
National Acme Co. (Multiple Spindle), 178 E.
131st St., Cleveland, Ohio.
Potter & Johnston Co., 1027 Newport Ave.,
Pawtucket, R. I.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, III.
Warner & Swasey Co., 5701 Carnegie Ave.,
Cleveland 3, Ohio.

CHUCKS, Air Operated

CHUCKS, Air Operated

Cushman Chuck Co., Windsor Ave., Hartford 2, Conn.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.

Hufford Machine Works, Inc., 1700 E. Grand Ave., El Segundo, Colif.
Logansport Machine Co., Inc., Logansport, Ind. Mead Specialties Co., 4114 North Knox Ave., Chicago 41, Ill.
Schrader's Son, A., 470 Vanderbilt Avenue, Brooklyn, N. Y.
Skinner Chuck Co., 344 Church St., New Britain, Conn.
Tomkins-Johnson Co., Jackson, Mich.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohlo.

CHUCKS, Collet or Split

See Collets.

CHUCKS, Diaphragm

Van Norman Co., 2640 Main St., Springfield 7, Mass. Woodworth, N. A., Co., 1300 E. Nine Mile Rd., Detroit 20, Mich. (Continued on page 296)





Neither can you get peak performance in CENTERLESS GRINDING with improper wheel selection.

Conscientious, skilled craftsmanship . . . Modern Manufacturing Equipment . . . Research Facilities . . . Personnel with Extensive Engineering Background . . . Exclusive Manufacturing Features . . . these factors all contribute to BAY STATE'S continued success in recommending proper grits, grades and bonds that completely solve centerless grinding wheel problems.



A wide range of sizes and specifications of vitrified centerless grinding wheels and rubber regulating wheels available for immediate shipment.

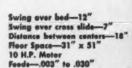
BAY STATE ABRASIVE PRODUCTS CO. Westboro, Massachusetts, U. S. A.

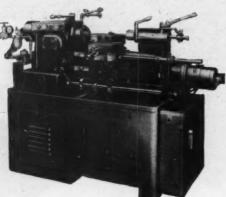
Branch Offices and Warehouses:
Chicago, Cleveland, Detroit, Pittsburgh
Distributors — All Principal Cities
In Canada: Bay State Abrasive Products Co. (Canada) Ltd., Brantford, Ont.



RIGIDITY & PO

to take heavy, high-speed cuts on high-Brinell and tough steels





Faster, more accurate with carbide tools LIPE Carbo-Lathes

with complete cycle electrically controlled

Bed and headstock cast in one piece from 500 pounds of chromemolybdenum-iron! Massive tailstock with a 3" diameter quill! Heavy bed sidewalls reinforced by cross ribs! These are the reasons why the Lipe Carbo-Lathe eliminates all deflection and weaving - why it is rigidly resistant to torsional stresses and strains.

Brute power and a wide range of selective speeds permit hogging feeds and cuts on high-Brinell steels, scaly surfaces, weld spots and jump cuts. Designed for carbide tools, this lathe insures faster, more accurate work.

More, the complete cycle can be electrically controlled. A push on the starter button starts the spindle, moves the carriage to the cutting position, automatically engages the mechanical feed. At the end of the

cut, the feed disengages, the spindle stops and the carriage returns quickly to the loading position. At every point in the cycle the operator has complete manual control.

Bring Your Present Lipe Carbo-Lathes Up to Date . . .

Lipe automatic cycle attachment may be applied to any Lipe Carbo-Lathe bearing a serial number of 200 or greater. See your Lipe distributor for full details.

Lipe Carbe-Lathes are sold with or without Automatic Cycle Attachment. Write for further information and delivery dates.



CHUCKS, Dell

Erickson Tool Div. Erickson Steel Co., 2309
Homilton, Cleveland, Ohio.
Ettco Tool Co., Inc., 592 Johnson Ave., Brooklyn, N. Y.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Jacobs Mfg. Co., West Hartford, Conn.
McCrasky Tool Corp., 1938 Thomas St., Meadville, Pa.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Skinner Chuck Co., 344 Church St., New Britain, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.

CHUCKS, Full Floating

Erickson Tools Div., Erickson Steel Co., 2309 Hamilton, Cleveland, Ohio. Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, Staten Island, N. Y. Gisholt Mch. Co., Madison 10, Wis.

CHUCKS, Goor

Horton, E., & Son Co., Windsor Locks, Conn., Woodworth, N. A., Co., 1300 E. Nine Mile Rd., Detroit 20, Mich.

CHUCKS, Lathes, Etc.

Buck Tool Co., 220 Schippers La., Kalamazeo, Mich.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Cushman Chuck Co., Windsor Ave., Hartford 2, Conn.
Erickson Tools Div., Erickson Steel Co., 2309
Hamilton, Cleveland, Ohio.
Gisholt Mch. Co., Wash Hartford, Conn.
Jacobs Mfg. Co., West Hartford, Conn.
Jones & Lamson Mch. Co., Springfield, Vt.
Horton, E., & Son Co., Windsor Locks, Conn.
Rivett Lathe & Grinder, Inc., Brighton, Boston
35, Mass.
Scherr, George, Co., Inc., 200 Lafayette St.,
New York 12, N. Y.
Skinner Chuck Co., 344 Church St., New
Britain, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Warner & Swasey Co., 5701 Carnegie Ave.,
Cleveland 3, Ohio.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio. Buck Tool Co., 220 Schippers La., Kalamazeo,

CHUCKS, Magnetic

Brown & Sharpe Mfg. Co., Providence, R. I. DoAll Co., 254 Laurel Ave., Des Plaines, III. Hanchett Magna-Lock Corp., Big Rapids, Mich. Taft-Peirce Mfg. Co., Woonsocker, R. I. Walker, O. S., Co., Inc., Worcester, Mass.

CHUCKS, Power Operated

Skinner Chuck Co., 344 Church St., New Britain, Conn.

CHUCKS, Quick Change and Safety

Erickson Tools Div., Erickson Steel Co., 2309
Hamilton, Cleveland, Ohio.
Errington Mechanical Laboratory, 24 Norwood
Ave., Stapleton, S. I., N. Y.
Jarvis, Charles L., Co., Middletown, Conn.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
National Tool Co., 11200 Madison Ave., Cleveland. Ohio. land, Ohio.

Neise, Karl A., Dept. M., 381 Fourth Ave., New York 16, N. Y.
Procurier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.

CHUCKS, Ring Wheel

Gardner Mch. Co., Div. Landis Tool Co., 414 E. Gardner St., Beloit, Wis.

CHUCKS, Topping

Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, S. I., N. Y. Jacobs Mfg. Co., West Hartford, Conn. McCrosky Tool Corp., 1938 Thomas St., Mead-ville, Pa. Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, III. Skinner Chuck Co., 344 Church St., New Britoin, Conn.

CIRCUIT-BREAKERS

General Electric Co., Schenectady 5, N. Y. (Continued on page 298)

WATSON-STILLMAN

Fire Power

QUICKLY...

EFFICIENTLY...ECONOMICALLY

with W-S ORDNANCE PRESSES

W-S Hydraulic Press flexibility of control is a natural for the precision required in shell forging manufacture. Combine this control with the economy of using only the press tonnage and stroke required and the exactly suitable speed and you have the answer to every pressing operation.

Reject percentage drops instantly, noise levels decrease, maintenance problems become insignificant when hydraulics take over your Ordnance press jobs. And hydraulics, of course, have been synonymous with Watson-Stillman for

more than a century.

Write now specifying your type and size of shell for today's W-S Press recommendations . . . it's backed by 104 years of hydraulic experience.



Shell Piercing Press



Shell Bander

Branch Office: 228 N. La Salle, Chicago, III.

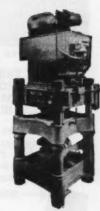


Manufactured in Canada by Canadian-Vickers, Ltd., Montreal



Cold Extrusion Press

Shell Hosing Press



Billet Breeker

Factory and Main Office:
HYDRAULIC MACHINERY DIVISION

ROSELLE, NEW JERSEY

ESTABLISHED 1848

W-S "Completeline" Hydraulics . . . The Shortest Distance From Production to Profits

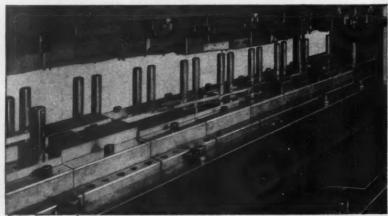
B. Jahn Production Proved Dies

speed carbine magazines from -

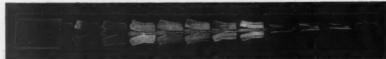


with new efficiency and economy!

Another evidence of B. Jahn versatility and ingenuity is this mammoth progressive die - one of the largest of its kind ever built! Measuring over six feet in length, this vital defense tool produces 40 carbine magazines per minute each identical! Each perfect! Each an example of flawless "proving ground" accuracy!



CARBINE DIE "SET UP" FOR PRODUCTION RUN



CARBINE DIE RIBBON SUBMITTED FOR CUSTOMER APPROVAL

THIS — LIKE EVERY B. JAHN BUILT DIE — WAS PRODUCTION PROVED TO ELIMINATE ALL ERROR, ALL CHANCE, ALL UNCERTAINTY AND TO GUARANTEE A FINER DIE PRODUCT!

In B. Jahn's modern plant, presses run 10 to 50,000 parts for customer's actual assembly line use before the die is certified PRODUCTION PROVED and shipped! B. Jahn's guarantee: the die must work in the customer's equipment to his unqualified satisfaction!

SEND TODAY for the "Story of B. Jahn PRODUCTION PROVED DIES!"





THE B. JAHN MANUFACTURING COMPANY, NEW BRITAIN, CONNECTICUT

298-MACHINERY, November, 1952

CLAMPING APPLIANCES FOR MACHINE TOOLS

Neise, Karl A., Dept. M., 381 Fourth Ave., New York 16, N. Y. Standard Shop Equipment Co., Inc., 8299 W. Tinicum Ave., Philodelphia, Pa.

CLAMPS

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, III.
Brown & Sharpe Mfg. Co., Providence, R. I.
Danly Mch. Specialties, Inc., 2107 S. 52nd
Ave., Chicago 50, III.
DoAll Co., 254 Laurel Ave., Des Plaines, III.
Mead Specialties Co., 4114 N. Knox Ave.,
Chicago 41, III.
Rivett Lathe & Grinder, Inc., Brighton, Boston
35, Mass.
Standord Shop Equipment Co., Inc., 8299 W.
Tinicum Ave., Philadelphia, Pa.
Starrett, The L. S., Co., 4thol, Mass.
Williams, J. H., & Co., 400 Vulcan St., Buffolo
7, N. Y.

CLEANERS, Chemical, for Metal

Bullard Co., Bullard-Dunn Process Div., Brewster St., Bridgeport 2, Conn. Ookite Products, Inc., 19 Rector St., New York, N. Y.

CLUTCHES

Barnes Drill Co., 814 Chestnut, Rockford, III.
Clearing Mch. Corp., 6499 W. 65th St., Chicago
38, III.
Farrel-Birmingham Co., Inc., 25 Main St.,
Ansonia, Conn.
Lipe-Rollway Corp., 806 Emerson Ave., Syrocuse, N. Y.
Morris Machine Tool Co., 9 Harriet St., Cincinnati 3, Ohio.
Rockford Clutch Div., Borg-Warner Corp., 410
Catherine St., Rockford, III.
Twin Disc Clutch Co., 1361 Racine St., Racine,
Wis. Wis. Warner Electric Brake & Clutch Co., Beloit, Wis.

COLLARS, Safety

Standard Pressed Steel Co., Jenkintown, Pa.

COLLETS

Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Automatic Machine Co., 4932 Beech
St., Cincinnati 12, Ohio.
Erickson Tools Div., Erickson Steel Co., 2309
Hamilton, Cleveland, Ohio.
Gisholt Mch. Co., 1245 E. Washington Ave.,
Madison 10, Wis.
Hardinge Bros., Inc., 1418 College Ave., Elmira
N. Y.
Hischmann, Cal. Co., 20, 20, 21 N. Y.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.
Pratt & Whitney, West Hartford 1, Conn.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Tokins-Johnson Co., Jackson, Mich.
Universal Engrg. Co., Frankenmuth, Mich.
Warner & Swasey Co., 5701 Carnegie Ave.,
Cleveland 3, Ohio.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

COMPARATORS

See Gages, Comparator.

COMPARATORS, Optical

DoAil Co., 254 Lourel Ave., Des Plaines, III.
Eastman Kodak Co., Rochester, N. Y.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Jones & Lamson Mch. Co., Springfield, Vt.
Scherr, George, Co., Inc., 200 Lafayette St.,
New York 12, N. Y.

COMPOUNDS, Cleaning

Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa. Oakite Products, Inc., 19 Rector St., New York, N. Y.

COMPOUNDS, Cutting, Grinding, Metal Drawing, Etc.

Cities Service Oil Co., 70 Pine St., New York, N. Y. Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.

(Continued on page 300)



equipped for external grinding. Simplicity

reduces set-up time on the variety of work normal to the toolroom and die shop. Collets and step chucks quickly mount single or repetitive pieces.

The new Rivett 84 grinds holes from the smallest up to 3" diameter, with a maximum 4" depth depending upon diameter; external work to 3" diameter by 4" length.

If you need versatility with extreme accuracy, you will want to learn more about this new grinder. Send for Catalog 84.

- * Internal Spindles 12,000 to 35,000 r.p.m.; sealed from

- Mechanical Power Table Travel with infinite adjus
- Hand Table Travel with coarse and fine fe to .001".



ATHE & GRINDER, Inc.

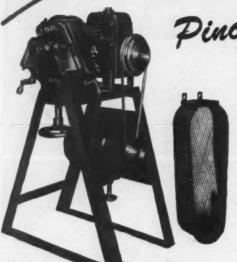
Dept. MR-11, Brighton 35, Boston, Massachusetts

For Mare Precision Work RELY ON RIVETT LATHES AND GRINDERS, The Master Craftsman's Master Tools



Tips on Metal Bending

HAT-YOU CAN DO ON



Pinch-Type Rolls

Buffalo No. 00 "Pinch-Type"

Bending Roll

The capacity table below shows the variety of small-diameter bending jobs which can be performed at production speeds on "Buffalo" Pinch-Type Bending Rolls. All rolls are adjusted by crank, and may be set up or changed in seconds. Bars, pipe or copper tubing can be rolled in continuous spirals without distortion. Bars may be bent in spirals for high production of perfect rings without wasting any material. If you bend metal, you do it at a fraction of the cost of any other method by "Buffalo" Bending Rolls. Bulletin 352-C has data on all sizes, from the small pinch type to the No. 4 for the heaviest bending. WRITE FOR YOUR COPY!

Capacities	00			00	
Angles—leg out	36x36x36	1362136256	Standard st. pipe	36	34
Minimum diameter	20	24	Minimum diameter	5	6
Angles—leg in	34834836	134x134x36	Diameter angle rolls	31/4	534
Minimum diameter	30	48	R.P.M. rolls	72.5	40
Smallest Angle-leg out	12812814	19219219	Feet per minute	75	60
Minimum diameter	4	6	Size motor-H.P.	11/2	2
Smallest Angle—leg in	12812816	1/28/28/6	Speed motor	1800	1200
Minimum diameter	6	7	Diameter upper shaft	115%	3
Flats on edge	5 c X 3 16	183 g	Diameter lower shafts	115 16	3
Minimum diameter	6	7	Gear Ratio	24	45
Flats on flat	2x2 pt	2x34	Length	2'-0"	3'-10"
Minimum diameter	8		Width	2'-0"	2'-6"
Rounds and squares	1 _g	34-1176	Height	1'-6"	2'-6"
Minimum diameter	5		Weight, lbs.	575	875
Copper tubes—12 gauge	34	1	Code	AJLIM	AHPUP
Copper tubes—16 gauge	1	11,			



BUFFALG 440 BROADWAY

MACHINE TOOLS

COMPANY

BUFFALO, NEW YORK

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

PUNCHING

SHEARING

CUTTING

BENDING

National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich. (Broaching & Lapping). Oakite Products, Inc., 19 Rector St., New York, Oakite Products, Inc., 19 Rector St., New Yark, N.Y.
Shell Oil Co., 50 West 50th St., New York, N.Y.
Shell Oil Co., 630 5th Ave., New York, N.Y.
Standard Oil Co., (1ndiana) 910 S. Michigan, Chicago, Ill.
Stuart, D. A., Oil Co., Ltd., 2739 S. Troy St., Chicago 23, Ill.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa. Texas Co., 135 E. 42nd St., New York, N.Y.
Place, New York, N.Y.

COMPOUNDS, Resin and Molding

Bakelite Co. Div., Union Carbide & Carb Corp., 30 E. 42nd St., New York 17, N. General Electric Co., Schenectady 5, N. Y.

COMPRESSORS, Air

Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y. Ingersoll-Rand Co., Phillipsburg, N. J.

CONTOUR FOLLOWER

Hirschmann, Carl, Co., 30 Park Awe., Man-hasset, N. Y. Turchan Follower Machine Co., 8259 Livernois and Alaska Aves., Detroit, Mich.

CONTRACT WORK

Arter Grinding Mch. Co., 15 Sagamore Rd., Worcester S, Mass.
Blanchard Mch. Co., 64 State St., Combridge, Mass.
Columbus Die-Tool & Mch. Co., 955 Cleveland Ave., Columbus, Ohio.
Diefendorf Geor Corp., 920 N. Belden Ave., Syracuse, N. Y.
Esler-Engra, Co., Inc., 760 S. 13th, Newark 3, N. J.
Fellows-Gear Shaper Co., Syrinefield Mc. N. J.
Fellows Gear Shaper Co., Springfield, Vt.
Gorham Tool Co., 14400 Woodrow Wilson,
Detroit, Mich.,
Hartford Special Mchry, Co., 287 Homestead
St., Hartford, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland, Ohlo.
Minster Machine Co., Minster, Ohlo.
Morse Twist Drill & Mch. Co., New Bedford,
Moss.
Moss.
Moss.
Moss. Mass.

Mummert-Dixon Co., Hanover, Pa.

National Acme Co., 170 E. 131st St., Cleveland, Ohio.

Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.

Rockford, Ill.,

Sheffield Corp., 721 Springfield, Dayton, Ohio.

Taft-Peirce Mfg. Co., Woonsocket, R. I.

U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

Wicaco Machine Corp., Stenton Ave. and Louden St., Philadelphia, Pa.

CONTROLLERS

Allen-Bradley Co., 1326 S. 2nd St., Milwaukee, Arrow-Hart & Hegeman Elec. Co., Hartford 6, Bristol Co., Platts Mills, Waterbury, Conn. General Electric Co., Schenectady 5, N. Y.

CONVEYORS FOR DUST, CHIPS, ETC. Hapman Conveyors, Inc.

COOLANT TABLES

Commander Mfg. Co., 4233 W. Kinzie St., Chicago 4, III.

COUNTERBORES

COUNTERBORES

Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.,
Allen Mfg. Co., 133 Sheldon St., Hartford 2, Conn.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich. Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth-Sterling Inc., McKeesport, Po.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Div., Unlon Carbide & Carbon Corp., 38 E. 42nd St., New York.
Kennametal, Inc., Latrobe, Pa.
(Continued on page 302)

(Continued on page 302)

Want better drill performance?

Then try grinding your drills on the grinders used and recommended by leading drill manufacturers....

SELLERS DRILL GRINDERS



Among Heavy Machine Tools built by Consolidated are

DATHES
BORING MILLS
DRILL PRESSES
MILLING MACHINES
BORING MACHINES
CORD SAW MACHINES
BORING, DEILLING AND
MILLING MACHINES
DELL AND TOOL
GRINDERS
FLANERS
SLOTTERS
BAREGOAD SHOP TOOLS
AND OTHER
AND OTHER

INCREASE PRODUCTION

Because Sellers correctly ground drills can be safely run at maximum speeds, they increase machine output.

LENGTHEN DRILL LIFE

Because with Sellers grinding, angles and clearances are correct, drill lips cut equally and efficiently, wear is minimized, less stock is removed when grinding, doubling drill life.

INCREASE HOLES PER GRIND

Because Sellers correct grinding reduces wear, drills remain sharp longer, require less grinding.

REDUCE OVERHEAD AND LABOR

Because Sellers precision grinding increases machine production, drilling costs are reduced.

LOWER ASSEMBLY COSTS

Because under- and over-size holes can be eliminated, reaming or bushing correction is avoidable, saving time and labor.

SALVAGE DAMAGED DRILLS

Because burned and broken drills ordinarily scrapped can be satisfactorily reclaimed and returned to profitable service.

A self-contained dry grinder, the Sellers No. 4-G has a proved record of top efficiency for grinding right hand and flat twist drills, 2, 3 and 4 lip up to 2" diameter. It has an actual maximum capacity for 2 and 4 lip drills up to 3" diameter and 3 lip up to 2%" diameter. Lips are ground to equal length, angle and clearance. Clearance as produced by the Sellers Method, automatically determined by the machine for different size drills, is sufficient to insure free cutting without weakening the cutting edges. Part replacement is negligible but, if ever required, replacement parts are always available. Complete information will be furnished upon request.

BUILDERS OF HEAVY DUTY MACHINE TOOLS SINCE 1848

BETTS . BETTS-BRIDGEFORD . COLBURN . HILLES & JONES . MODERN . NEWTON . SELLERS



CONSOLIDATED

SUBSIDIARY OF FARREL-BIRMINGHAM COMPANY, INCORPORATED

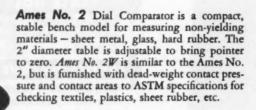
ROCHESTER, NEW YORK

FOR Trictly IMPERSONAL INSPECTION **DIAL COMPARATORS**

Ames Dial Comparators make the inspection of duplicate parts an extremely simple, rapid and accurate operation. Ames Comparators are strictly impersonal in their accuracy - the results being in no way de-pendent on the skill or judgment of the operator. The pressure of the gauging members against the work is mechanically determined and therefore uniform.

> Check the Ames Dial Comparators shown - one of them may solve a Quality Control problem for you.

Ames No. 1 Dial Comparator is an easily adjustable bench model that measures objects up to 2" in cross section. The table bracket may be quickly located and locked in position on the column. The table itself may be further positioned and locked for final fine adjustment. This comparator is designated Ames No. 1W when equipped with dead-weight contact pressure and contact area to ASTM specifications for measuring resilient materials, such as rubber, plastics, etc.



Ames No. 13 Dial Comparator features flat-ground, cast-iron base of ample size for using V-blocks and locating fixtures for checking rounds, flats and odd shapes. Also, the No. 13 can be fitted with a fine adjustment for close setting. Accurately adjustable bracket holds any Ames Micrometer Dial Indicator.

Ames No. 130 Dial Comparator is designed especially for inspecting comparatively large parts. For this reason, the flat-ground steel base, the adjustable indicator support on which can be mounted any Ames Micrometer Dial Indicator, and the upright column are proportioned to suit the user's particular requirements.

Send us your Quality Control job specifications, and we will supply complete details and proposal without obligation.

B. C. AMES CO. T. Amer Mired

National Tool Co., 11200 Madison Ave., Cleve-land, Ohio.
National Twist Drill & Tool Co., Rochester Mich.
Pratt & Whitney, West Hartford 1, Conn.
Standard Tool Co., 3950 Chester Ave., Cleve-land, Ohio.
Starrett, The L. S., Co., Athol, Mass.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Threadwell Tap & Die Co., 16 Arch St., Green-field, Mass.
Union Twist Drill Co., Athol, Mass.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

COUNTERSHAFTS

Standard Pressed Steel Co., Jenkintown, Pa.

COUNTERSINKS

Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio. Ex-Cell-O Corp., 1200 Oakman Bivd., Detroit 32, Mich. Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich. Greenfield Tap & Die Corp., Greenfield Mass. Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York. Morse Twist Drill & Mch. Co., New Bedford, Mass. National Twist Drill & Tool Co., Rochester, Mich. Severance Tool Industries, Inc., 636 lowa Ave., Mich.
Severance Tool Industries, Inc., 636 lowa Ave.,
Saginaw, Mich.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Super Tool Co., 21650 Hoover Rd., Detroit 13,
Mich.
Union Twist Drill Co., Athol, Mass.

COUNTERS, Revolution

Bristol Co., Platts Mills, Waterbury, Conn. Brown & Sharpe Mfg. Co., Providence, R. I. Millers Falls Co., Greenfield, Mass. Starrett, The L. S., Co., Athol, Mass. Veeder-Root, Inc., 20 Sargent St., Hartford, Conn.

COUNTING DEVICES

Starrett, The L. S., Co., Athol, Mass. Veeder-Root, Inc., 20 Sargent St., Hartford,

COUPLINGS, Flexible

Boston Gear Works, 3200 Main St., North Quincy, Mass. Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn. Philadelphia Gear Works, Erie Ave. and G St., Philadelphia, Pa.

COUPLINGS, Shaft

Boston Gear Works, 3200 Main St., North Quincy, Mass. Northwestern Tool & Engrg. Co., 117 Hollier, Dayton, Ohio. Standard Pressed Steel Co., Jenkintown, Pa.

CRANES, Electric Traveling

Cleveland Crane & Engra. Co., Wickliffe, Ohio. Morgan Engra. Co., Alliance, Ohio. Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

CRANES, Hand Traveling

Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

CUTTER GRINDERS

See Grinding Machines, for Sharpening Cutters, Reamers, Hobs, Etc.

CUTTERS, Gear

Brown & Sharpe Mfg. Co., Providence, R. I. Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 6, Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 6, Mich.
Fellows Gear Shaper Co., 78 River St., Spring-field, Vt.,
Michigan Tool Co., 7173 E. McNichols Rd.,
Detroit 12, Mich.
Morse Twist Drill & Mch. Co., New Bedford,
Mass.
National Broach & Mch. Co., 5600 St. Jean
Ave., Detroit 2, Mich. (Shaving). (Continued on page 306)

Logan AIR AND HYDRAULIC POWER

SPEEDS, COORDINATES, REFINES PRODUCTION | IN MORE THAN 10,000 INDUSTRIAL PLANTS .

LOGAN ROTATING AND NONROTATING
HYDRAULIC CYLINDERS . . .





TYPICAL APPLICATION OF LOGAN ROTOCAST CYLINDERS



Hydraulic shearing press with 4 standard ROTOCAST Hydraulic Cylinders to retract the lower knie after shearing cut. (Central cylinder is special single-acting hydraulic cylinder.)

WRITE FOR YOUR FREE COPIES LOGAN TECHNICAL MANUALS THE CIRCUIT RIDER . . .

A 32-page booklet on basic designs in fluid power circuits together with drawings as a guide to more effective application.

THE FACTS OF LIFE . . .

A 24-page booklet on the "Do's and Don'ts" in installation, operation and maintenance of Air and Hydraulic equipment.

Logan Engineers will help you design your Air and Hydraulic circuits.

LOGAN MANUFACTURES 6,975 CATALOGED ITEMS Free Catalog On Request

AIR CONTROL VALVES
CATALOG 100-4

:

AIR CHUCKS

CATALOG 70-1

AIR CYLINDERS
CATALOG 100—1, also 100—2
AIR and HYDRAULIC PRESSES

숙분

COLLET-GRIP TUBE FITTINGS
CATALOG 200-5

HYDRAULIC CONTROL VALVES CATALOG 200-4

HYDRAULIC CYLINDERS
CATALOG 200—2, also 200—3
HYDRAULIC POWER UNITS

CATALOG 51 CATALOG 200-1 SURE-FLOW COOLANT PUMPS CATALOG 62 Air and Hustraulic Equipment

LOGANSPORT MACHINE CO., INC. . 810 CENTER AVENUE, LOGANSPORT, INDIANA

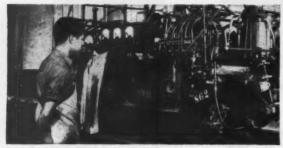
FLUID POWER SPECIALISTS SINCE 1936



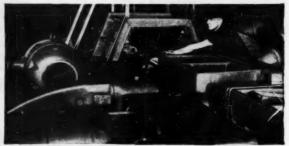
FIRST step up in Progressive Mechanization's step-by-step approach is replacing hand operations with simple machines.



SECOND stage brings in improved machines. Example: grinding wheel with high-frequency motor for small-hole finishing.



THIRD change introduces automatic control for more complex machines, in this case an automatic multiple milling machine.



FOURTH level is continuous process with co-ordinated machines, like this automatic transfer machine for cylinder blocks.

New PROGRESSIVE MECHANIZATION program promotes your long-range machine sales

As a machinery manufacturer, you have an important stake in "Progressive Mechanization," the new More Power to America program just launched by General Electric. Addressed to your customers, it introduces a planned, step-by-step approach to the goal of greater mechanization in industry—a practical way to bring about increased productivity, better products, and lower manufacturing costs.

Widening the long-range market for the machines you build, this co-operative program comprises a sound-color movie, a descriptive manual and a survey form and checklist. For more information on Progressive Mechanization, ask your G-E Apparatus representative to arrange a showing of the movie. Meanwhile, send for your free copy of the program manual, GEA-5789.

GENERAL E ELECTRIC

THIS METER "CLOCKS" MACHINES, SAVES USERS TIME AND MATERIAL



When you equip your machine with a G-E Type KT time meter, your customer has an accurate record of active, earning machine time. Savings in time and material pay for the meter many times over. Panelmounted (shown), portable, and conduit-mounted types record hours, tenths of hours, or minutes. See Bulletin GEC-472.

NEW FHP MOTOR SMALLER, LIGHTER, BETTER LOOKING, MORE VERSATILE

Here are just four of the many advantages you'll find in G.E.'s new Form G fractional-hp motor: Smaller size saves space on driven machines. Lighter weight cuts your handling and shipping costs. Better appearance enhances product sales appeal. Versatile, allangle operation means this standard motor can often replace specials. See Bulletin GEA-5567.



ALL OPERATORS INTERCHANGEABLE IN BIG NEW PUSH-BUTTON LINE



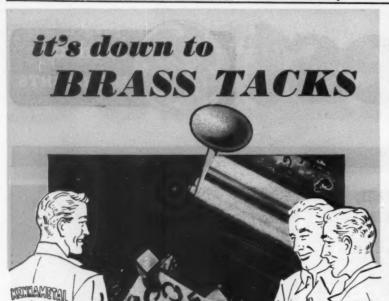
Your every design need is met in General Electric's big new line of oiltight pushbutton units. Just one example of its "building-block flexibility" is the complete range of separable, interchangeable operators available. You benefit from cff-the-shelf shipments, smaller inventories, faster assembly of components. See Bulletin GEA-5779.



Build in electric heat—clean, convenient, easily controlled

In each package-making machine built by a Massachusetts company, eight General Electric tubular heaters are imbedded in the block which shapes packages, melts paraffin, and dries glue. When your machine needs a "zone" of heat, specify a G-E electric heater for clean, convenient, easily-controlled heat. The full line includes immersion, strip, cartridge, tubular, and fin heaters. See 64-page Bulletin GEC-1005.

Pie	ase send me the following bulletins:
V	for reference purposes
X	in connection with immediate projects
	GEA-5567 Form G F-hp Motors
	GEA-5779 Oiltight Push-button Units
	GEA-5789 Progressive Mechanization
	GEC-472 Type KT Time Meter
	GEC-1005 Electric heaters
PROD	ULT YOUR McGRAW-HILL ELECTRICAL CATALOG FOI UCT ENGINEERSI You'll find "everything electric" fo nery manufacturers in the General Electric Section.
MAM	
COMP	ANY



KENNAMETAL "IN-PLANT" TRAINING

program on carbide tooling



No frills or fuss in the Kennametal "In-Plant" Training Program. We show your men how to select the right carbide tool for the job, use it properly, and resharpen it correctly; as well as how to simplify tool stocks and smooth out kinks in operating routines.

This program is practical - not academic; not theoretical. In your own plant it applies the on-the-job "know-how" of our field organization — and this experience is greater than that of any other carbide tool manufacturer.

The objective of Kennametal's "brass-tacks" program is to help you get top performance from a tool material that's made to give you more production in less time, at less cost. Ask our nearest field engineer for the facts. Kennametal Inc., Latrobe, Pa.



National Tool Co., 11200 Madison Ave., Cleve-land, Ohio.
National Twist Drill & Tl. Co., Rochester, Mich. Pratt & Whitney, West Hartford 1, Conn. Standard Tool Co., 3950 Chester Ave., Cleve-land, Ohio. Union Twist Drill Co., Athol, Mass. Waltham Mch. Wks., Newton St., Waltham, Mass. Mass.
Wesson Co., 1220 Woodward Heights Blvd.,
Ferndale, Mich.

CUTTERS, Keyseater

Davis Keyseater Co., 405 Exchange St., Rochester B, N. Y. Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich. Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich. Keo Cutters, 19326 Woodward, Detroit, Mich. Threadwell Tap & Die Co., 16 Arch St., Green-field, Mass. Wesson Co, 1220 Woodward Heights Blvd., Ferndale, Mich.

CUTTERS, Milling

CUTTERS, Milling

Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.

Atrax Co., Newington, Conn.

Barber-Colman Co., Rock St., Rockford, Ill.

Brown & Sharpe Mfg. Co., Providence, R. I.

Carboloy Dept., General Electric Co., Box 237,

Roosevelt Park Annex, Detroit 32, Mich.

Cleveland Twist Drill Co., 1242 E. 49th St.,

Cleveland, Ohio.

Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.

Firth-Sterling Inc., McKeesport, Pa.

Ford, M. A., Mfg. Co., 7401 W. 1st St.,

Davenport, Iowa.

Gorham Tool Co., 14400 Woodrow Wilson,

Detroit, Mich.

Gorton, George, Mch. Co., 1110 W. 13th St.,

Racine, Wis.

Haynes Stellite Div., Union Carbide & Carbon

Corp., 30 E. 42nd St., New York, N. Y.

Ingersoll Milling Mch. Co., 2442 Douglas St.,

Rockford, Ill.

Kearney & Trecker Corp., Milwaukee, Wis.

Kennametal, Inc., Latrobe, Pa.

Lovejoy Tool Co., Inc., Springfield, Vt.

McCrosky Tool Corp., 1938 Thomas St., Mead
ville, Pa.

Morse Twist Drill & Mich. Co., New Bedford,

Mass.

Notional Tool Co., 11200 Madison Ave., Cleve-Mass. National Tool Co., 11200 Madison Ave., Cleve-National Tool Co., 11200 Madison Ave., Cleve-iand, Ohio.
National Twist Drill & Tl. Co., Rochester, Mich.
Onsrud Machine Works, Inc., 3940 Palmer St.,
Chicago, Ill.
Pratt & Whitney, West Hartford 1, Conn.
Severance Tool Industries, Inc., 636 lowa Ave.,
Saginaw, Mich.
Super Tool Co., 21650 Hoover Rd., Detroit 13,
Mich. Saginaw, Mich.
Super Tool Co., 21650 Hoover Rd., Detroit. C.,
Mich.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Tomkins-Johnson Co., Jackson, Mich.
Union Twist Drill Co., Athol, Mass.
Wesson Co., 1220 Woodward Heights Blvd.,
Ferndale, Mich.
Willey's Carbide Tool Co., 1340 W. Vernor
Hwy., Detroit 1, Mich.

CUTTERS. Rotary

See Files and Burs, Rotary.

CUTTING COMPOUNDS

See Compounds, Cutting, Grinding, Etc.

CUTTING AND GRINDING FLUIDS

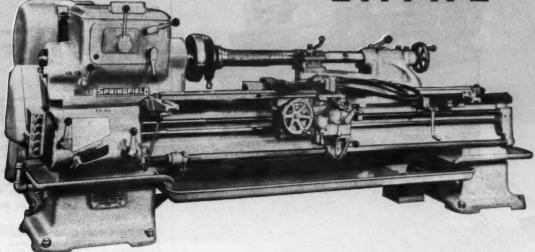
Cimcool Div., Cincinnati Milling Mch. Co., Cincinnati, Ohio. Cities Service Oil Co., 70 Pine St., New York, N. Y. DoAll Co. 254 Lourel Ave., Des Plaines, Iil. Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa. Sinclair Refining Co., 630 5th Ave., New York, N. Y.
Standard Oil Co. (Indiana), 910 S. Michigan,
Chicago, III.
Stuart, D. A., Oil Co., Ltd., 2739 S. Troy St.,
Chicago 23, III.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.
Texas Co., 135 E. 42nd St., New York, N. Y.
Tide Water Associated Oil Co., 17 Battery
Place, New York, N. Y.

CUTTING-OFF MACHINES

Bardons & Oliver, Inc., Ft. W. 9th St., Cleveland 13, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I. (Continued on page 308)

SPRINGFIELD

Contouring LATHE



The simplicity of the SPRINGFIELD Hydraulic Contouring Attachment is outstanding. Pilot or control circuits, remote control valves and other troublesome elements are eliminated. A motor driven hydraulic pump, relief valve and oil reservoir are the self-contained power unit furnishing hydraulic pressure to the servo-valve and full universal hydraulic compound rest. A supported and guided adjustable template holder conveniently holds templates at the front of the lathe in full view of the operator. There are no complicated mechanisms or fragile units.

SPRINGFIELD Hydraulic Contouring lends itself perfectly to lower production costs per unit on large or small runs.

Opposed hydraulic pressures in the hydraulic cylinder hold the slide solidly for heavy duty cutting.

Full universal hydraulic compound swivels to the best angle for contouring each individual job.

Standard SPRINGFIELD Lathes with swings from $14^{\prime\prime}$ to $32^{\prime\prime}$ are used in conjunction with the hydraulic contouring attachment thus giving complete standardization of components.

Quick changeover from standard SPRINGFIELD Engine Lathe operation to contouring is made easily.

Positive, smooth, continuous, backlash-free hydraulic movement gives superior finish on turning, boring or facing.

Close coupling of stylus, servo-valve and cylinder eliminate long hydraulic lines, sluggish action and resulting inaccuracies. The SPRINGFIELD Hydraulic Contouring attachment does not reduce the normal swing capacity of the lathe.

Write for Bulletin No. 184

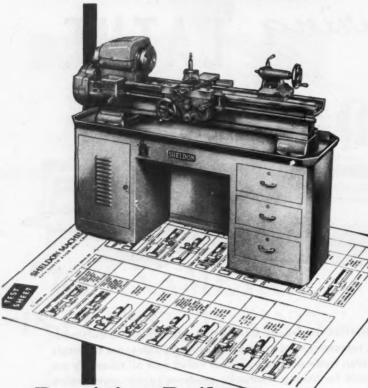
THE SPRINGFIELD MACHINE TOOL COMPANY

SPRINGFIELD, ONIO, U. S. A.

GENERAL DISTRIBUTORS: BRYANT MACHINERY & ENGINEERING COMPANY, 400 WEST MADISON ST., CHICAGO 6

EXCLUSIVE REPRESENTATIVES IN ALL PRINCIPAL CITIES

Tool Room Lathes



Precision Built for Precision Work

> Each SHELDON Lathe is a precision machine tool that in final inspection has passed the 19 accuracy checks on the SHELDON "Inspection Test Sheet".

> Produced by modern methods with the finest special machines, these 10", 11" and 12" (swings 13") lathes are quality built on a quantity production basis. Selling at quantity production prices they are today's best lathe values.

Write for Catalog with Test Sheet

SHELDON MACHINE CO., INC.

4246 North Knox Ave., Chicago 41, Illinois

Cone Automatic Mch. Co., Windsor, Vt. (Lathe Type).
Consolidated Mch. Tool Co., Rochester, N. Y. Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y. Landis Mathine Co., Waynesboro, Pa. (Pipe). Modern Machine Tool Co., 601 S. Water St., Jackson, Mich. (Lathe Type for Tubing).

CUTTING OFF MACHINES, **Abrasive Wheel**

Campbell Mch. Div., American Chain & Cable, 929 Cann. Ave. Bridgeport Conn. Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa-Hirschmann, Cari, Co., 30 Park Ave., Manhasset, N. Y.

CUTTING-OFF MACH'NES, Cold Saw

See Sawing Machines, Circular.

CUTTING-OFF MACHINES, Metal Band Saws

Armstrong-Blum Mfg. Co., 5700 W. Blooming-dole Ave., Chicago, III.
DoAll Co., 254 Laurel Ave., Des Plaines, III.
Fanco Machine Co., 3134 Sheridan Rd.,
Kenosha, Wis.
Grob Bros., Grafton, Wis.

CUTTING-OFF TOOLS

CUTTING-OFF TOOLS

Allegheny Ludium Steel Corp., Pittsburgh, Pa. Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, III.

DoAll Co., 254 Laurel Ave., Des Plaines, III.

F. 'h-Sterling Inc., McKeesport, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Kennametal, Inc., Latrobe, Pa.
Luers, J. Milton, 12 Pine St., Mt. Clemens, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Wesson Co., 1220 Woodward Heights Blvd.,
Ferndale, Mich.
Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

CUTTING-OFF WHEELS, Abrasive

Bay State Abrasive Co., Westboro, Mass. Carborundum Co., Buffalo Ave., Niagara Falls, N. Y. Norton Co., 1 New Bond St., Worcester, Mass.

CYLINDER BOR'NG MACHINES

Baker Bros., Inc., Sta. F, P. O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill. Con-olidated Mch. Tool Corp., Rochester, N. Y. Cross Co., 3250 Bellevue Ave., Detroit 7, Mich. Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich. Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Moiline Tool Co., 102 20th St., Molline, I'll. Snyder Tool & Enainmering Co., 3400 E. Lafayette, Detroit 7, Mich.

CYLINDERS, Air

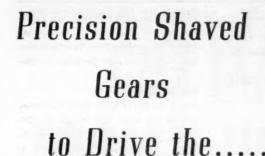
Hanna Engineering Works, 1752 Eiston Ave., Chicago, III. Chicago, III.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, III.
Mead Specialties Co., 4114 North Knox Ave., Chicago 41, III.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Tomkins-Johnson Co., Jackson, Mich.

CYL'NDERS, Hydraulic

Barnes, John S. Corp., Rockford, III. Hanna Engineering Works, 1752 Elston Ave., Chicago, III. Hann'f n Corp., 1101 S. Kilbourn Ave., Chicago, III. HII.
Hydraulic Press Mfg. Co., 300 Lincoin Ave.,
Mt. Gilead, Ohio.
Locan-port Machine Co., Inc., Logan-port, Ind.
National Forge & Ordnance Co., Irvine, Warren
County, Pa.
Rivett Lathe & Grinder, Inc., Brighton, Boston
35. Mars. 35. Mars.
Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, III.
Tomkin-Johnson Co., Jackson, Mich.

DEALERS, Mac'intry

Botw'nik Bros. of Mass., Inc., 14 Sherman St., Worcester, Mass. Earle Gear & Mch. Co., 4707 Stenton Ave., Wayne Junction, Philadelphia 44, Pa. (Continued on page 310)

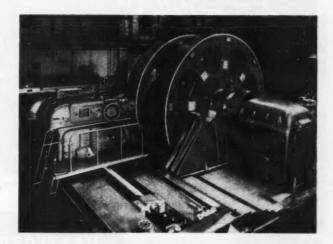


SS UNITED STATES

The largest, fastest, most luxurious ocean liner ever built in this country is an outstanding example of American know-how and initiative. Built by the Newport News Shipbuilding and Dry Dock Co., she carries the products of every state in the Union, including the finest mechanical equipment American industry can produce.

Among the important mechanical elements of the ship's propulsion machinery are the mammoth reduction gears made by Westinghouse Electric Corporation. To achieve the perfection of tooth surface required in these gears, they were finished on Red Ring Gear Shaving Machines.

These machines are built to shave gears of any size—from the smallest instrument gear to the largest marine gear.





NATIONAL BROACH & MACHINE CO.

5600 ST. JEAN DETROIT 13, MICHIGAN

WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT

MACHINERY, November, 1952-309

Motch & Merryweather Mchry. Co., Penton Bidg., Cleveland, Ohio. Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, III. Simmons Mch. Tool Corp., 1600 N. Broadway, Albany, N. Y.

DEMAGNETIZERS

Blanchard Mch. Co., 64 State St., Cambridge, Mass.
Heald Mch. Co., 10 New Bond St., Worcester 6,
Mass. Walker, O. S., Inc., Worcester, Mass.

DESIGNERS, Machine and Tool

Bath, Cyril, Co., 6984 Machinery Ave., Cleveland 3, Ohio.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Pioneer Engrg. & Mfg. Co., 19679 John R St., Detroit, Mich.
Pioneer Pump & Mfg. Co., 19679 John R St., Detroit, Mich.

Prott & Whitney, West Hartford I, Conn.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Snyder Tool & Engineering Co., 3400 E.
Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St.,
Rockford, III.
Vinco Corp., 8855 Schaefer Highway, Detroit
27, Mich.

DIAMONDS AND DIAMOND TOOLS

Meyers, W. F., Co., Bedford, Ind. Precision Diamond Tool Co., 102 South Grove Ave., Elgin, III.

DIE-CASTING

See Castings, Die.

DIE-CASTING MACHINES

British Industries Corp., International Mchry. Div., 164 Duane St., New York, N. Y. Cleveland Automatic Machine Co., 4932 Beech St., Cincinnati 12, Ohio.

HARTFORD | pecial

Hydraulic Press Mfg. Co., Mt. Gilead, Ohio. Hydropress, Inc., 350 Fifth Ave., New York 1, N. Y. Kux Machine Co., 3930 W. Harrison St., Chicago, III. Lake Erie Engineering Corp., Kenmore Station, Buffaio, N. Y. Reed-Prentice Corp., 677 Cambridge St., Wor-cester, Mass.

DIE CUSHIONS

Bliss, E. W., Co., 1375 Raff Rd., S. W., Canton, Ohio.
Clearing Mch. Corp., 6499 W. 65th St., Chlcago, III.
Dayton Rogers Mfg. Co., 2824 13th Ave., S.,
Minneapolis 7, Minn.
Verson Allsteel Press Co., 93rd St. and S.
Kenwood Ave., Chicago, III.

DIE INSERTS, Carbide

Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.
Allegheny Ludlum Steel Corp., Pittsburgh, Pa. Carboloy Dept., General Electric Co., Box 237., Roosevelt Park Annex, Detroit 32, Mich. Firth-Sterling Inc., McKeesport, Pa. Kennametal, Inc., Latrobe, Pa. Metal Carbides Corp., Youngstown, Ohio. Willey's Carbide Tool Co., 1340 W. Vernor-Hwy., Detroit 1, Mich.

DIEMAKERS' SUPPLIES

Allied Products Corp., 12677 Burt Rd., Detroit Allied Products Corp., 12677 Burt Rd., Detroit23, Mich.
Danly Mch. Specialties, Inc., 2107 S. 52nd:
Ave., Chicago 50, III.
Detroit Die Set Corp., 2895A W. Grand Blvd.,
Detroit 2, Mich.
Producto Mch. Co., 990 Housatonic Ave.,
Bridgeport, Conn.
U. S. Tool Co., Inc., 255 North 18th St.,
Ampere, N. J.

DIEMAKING MACHINES

Grob Bros., Grafton, Wis. Hirschmann, Carl, Co., 30 Park Ave., Man-hasset, N. Y. Kearney & Trecker Corp., Milwaukee, Wis. Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.

DIE SETS, Standard

Danly Mch. Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, III.
Detroit Die Set Corp., 2895A W. Grand Blvd., Detroit 2, Mich.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Producto Mch. Co., 990 Housatonic Ave., Bridgeopt. Conn. Producto Mch. Co., 990 Housatonic Ave., Bridgeport, Conn. Wales-Strippit Corp., North Tonawanda, N. Y.

DIE-SINKING MACHINES

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio. Cincinnati Milling Mch. Co., Cincinnati, Ohio. Gorton, George, Machine Co., 1110 W. 13th St., Racine, Wis.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Pratt & Whitney, West Hartford 1, Conn. Reed-Prentice Corp., 677 Cambridge St., Worcester, Mass.

DIE-SINKING PRESSES

Baldwin-Lima-Hamilton Corp., Philadelphia 42, Kearney & Trecker Corp., Milwaukee, Wis.

DIE STOCKS

See Stocks, Die.

DIES, Sheet Metal, Etc.

Allied Products Corp., 12677 Burt Rd., Detroit-23, Mich. Bath, Cyril, Co., 6984 Machinery Ave., Cleve-land 3, Ohio. Bliss, E. W., Co., 1375 Raff Rd., S. W., Canton, Bliss, E. W., Co., 13/5 Karr Kd., S. W., Canton, Ohio. Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich. Chambersburg Engrg. Co., Chambersburg, Pa. Columbus Die-Tool & Mch. Co., 955 Cleveland Ave., Columbus, Ohio. (Continued on page 312)



THE HARTFORD SPECIAL MACHINERY CO., HARTFORD 12, CONN.

DRILLING

MILLER ELECTRIC

CUT MACHINING TIME FROM 2 HOURS to A HOUR and ELIMINATED WARPAGE

WITH GROUND AND POLISHED

STRESSPROOF

SEVERELY COLD-WORKED, FURNACE-TREATED
STEEL BARS

This 2½" generator shaft, 19½" long, must be drilled through its entire length, have both ends stepped down, and keyseated for 10¾". Ground accuracies are required for pressing on the armature. Drilling was a headache and the keyseating often resulted in severe warpage. It required two hours to finish one shaft.

Three different steels were tried before switching over to STRESS-PROOF. When Ground and Polished STRESS-PROOF was used, machining time was cut in half—one hour instead of two hours. Warpage was eliminated and the shaft itself was much stronger.

STRESSPROOF makes a better part at a lower cost.

STRESSPROOF has improved quality and lowered costs in hundreds of similar applications because of its unique combination of four qualities in-the-bar: (1) High Strength, double that of ordinary cold-finished shafting; (2) Machinability, fully 50% better than heat-treated alloys of the same strength; (3) Wearability, without case hardening; and (4) Minimum Warpage. STRESSPROOF is available in cold-drawn or ground and polished finish.



Please send me your STRESSPROOF Bulletin.

La Salle STEEL CO.

... the Most Complete Line of
Carbon and Alloy Cold-Finished
and Ground and Polished Bars in America.

Name	
Title	
Company	
Address	
City	Zone—State—

Are Welder, made by Miller Electric

Manufacturing Co., Appleton, Wis.,

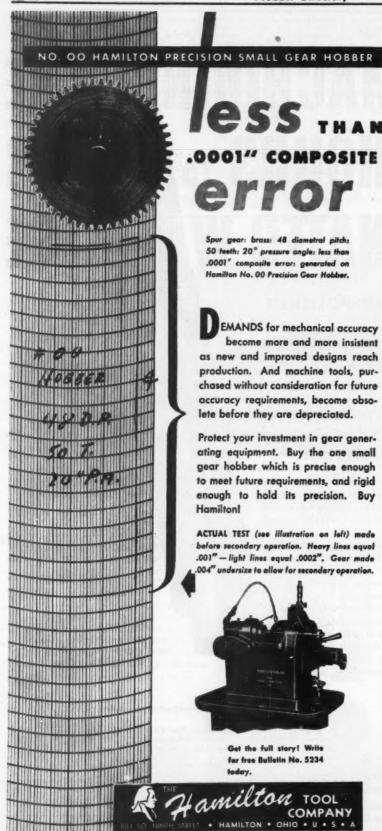
uses STRESSPROOF in the ge

SEND FOR ...

Free Engineering Bulletin

"New Economies in the Use

of Steel Bars"



Dreis & Krump Mfg. Co., 7416 Loomis Blvd., Chicogo 36, III.
Ferracute Mch. Co., Bridgetan, N. J.
Ford, M. A., Mfg. Co., 7401 W. 1st St., Daverport, Iowa.
Jahn, B., Manufacturing Co., Ellis St., New Britain, Conn.
Metal Carbides Corp., Youngstown, Ohio.
Niagara Mch. & Tool Wks., 683 Northland Ave., Buffalo, N. Y.
Pioneer Pump & Mfg. Co., 19679 John R St., Detroit, Mich.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
V & O Press Co., Div. Emhart Mfg. Co., Hudson, N. I.
Verson Allsteel Press Co., 93rd St. and S.
Kenwoold Ave., Chicago, III.
Wales-Strippit Corp., North Tonawanda, N. Y.
Woltham Mch. Wks., Newton St., Waltham, Mass.

DIES, Threading

Butterfield Div., Union Twist Drill Co., Derby Line, Vt.
Card, S. W., Mfg. Co., Mansfield, Mass. Detroit Tap & Tool Co., Detroit, Mich. Eastern Mch. Screw Corp., New Haven, Conn. Geometric Tool Co., Westville Station, New Haven 15, Conn. Greenfield Tap & Die Corp., Greenfield, Mass. Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio., Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Pratt & Whitney, West Hartford I. Conn. Sheffield Corp., 721 Sprinsfield, Dayton, Ohio. Standard Tool Co., 3950 Chester Ave., Cieveland, Ohio.
Threadwell Tap & Die Co., 16 Arch St., Greenfield, Mass.
Winter Bros. Co., Rochester, Mich.

DIES, Threading, Opening

Eastern Mch. Screw Corp., New Haven, Conn. Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, S. I., N. Y. Geometric Tool Co., Westville Station, New Haven 15, Conn. Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio. Jones & Lamson Mch. Co., 160 Clinton St., Sprinofield Vt. Landis Mch. Co., Wavnesboro, Pa. National Acme Co., 170 E. 131st St., Cleveland, Ohio. Sheffield Corp., 721 Springfield, Dayton, Ohio.

DIES, Thread Rolling

Detroit Tap & Tool Co., Detroit, Mich. Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y. Pratt & Whitney, West Hartford 1, Conn. Sheffield Corp., 721 Springfield, Dayton, Ohio.

D'SCS, Abrasiva

Besly-Welles Corp., Beloit, Wis.
Carborundum Co., Buffalo Ave., Niagara Falis,
N.Y.
Gardner Machine Co., 414 E. Gardner St.,
Beloit, Wis.
Norton Co., I New Bond St., Worcester, Mass.
Simonds Abrasive Co., Tacony & Fraley Sts.,
Bride-burg, Philadelphia, Pa.
Walls Sales Corp., 333 Nassau Ave., Brooklyn
22, N. Y.

DIVIDING HEADS

See Index Centers.

DOWEL P'NS

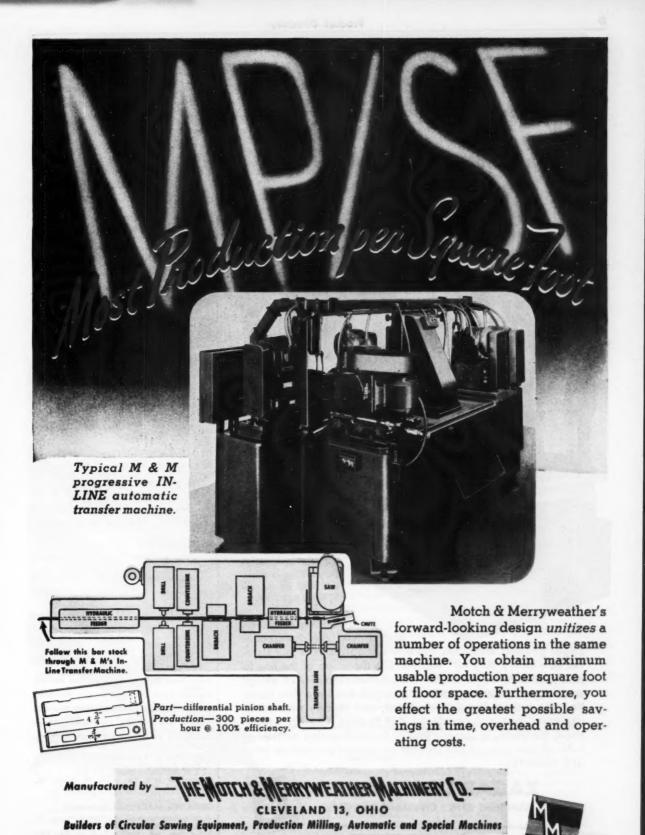
Allen Mfg. Co., 133 Sheldon St., Hartford 2, Conn. Danly Mch. Specialties, Inc., 2107 S. 52nd Ave, Chicano 50, Iil. Detroit Die Set Corp., 2895A W. Grand Blvd., Detroit 2, Mich. Producto Mechine Co., 990 Housatonic Ave., Bridgeport, Conn. U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

DRAFTING MACHINES

Universal Drafting Mch. Corp., 7960 Lorain Ave., Cleveland, Ohio.

DRESSERS, Grinding Wheel

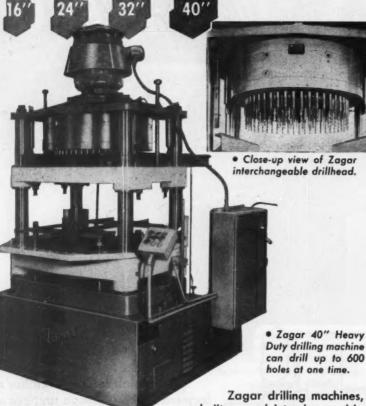
Carbolay Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich. (Continued on page 314)



PRODUCTION - WITH - ACCURACY . MACHINES AND EQUIPMENT



Successful line is now standardized in 4 sizes



holes at one time. Zagar drilling machines. built around interchangeable

Zagar gearless drillheads, are now standardized in four sizes. The new heavy duty 40" machine lifts the scope of the line to such jobs as turbo-jet engine frames. Yet simplicity of design enables set-ups to be made or changed over in a few hours. You get greater horsepower, thrust, and rigidity and better alignment than in conventional drill presses. Greatly broadened, therefore, is Zagar's facility for drilling any number of holes at one pass, in any pattern on centers as close as twice drill diameter.

ZAGAR TOOL, Inc. 24000 Lakeland Blvd., Cleveland 23, Ohio





Erickson Tools Div., Erickson Steel Co., 2309
Hamilton, Cleveland, Ohio.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit
32, Mich.
Hoglund Engrg. & Mfg. Co., Inc., Berkeley
Heights, N. J.
Metal Carbides Corp., Youngstown, Ohio.
Meyers, W. F., Co., Bedford, Ind.
Moore Special Too Co., Inc., 724 Union Ave.,
Bridgeport, Conn.
Norton Co., I New Bond St., Worcester, Mass.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Super Tool Co., 21650 Hoover Rd., Detroit 13,
Mich.

DRIFTS, Drill

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill. Standard Tool Co., 3950 Chester Ave., Cleve-land, Ohio.

DRILL HEADS, Multiple Spindle

DRILL HEADS, Multiple Spindle

Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohio.

Barnes Drill Co., 814 Chestnut, Rockford, Ill. Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.

Canedy-Otto Div., Cincinnati Lathe & Tool Co., Oakley, Cincinnati, Ohio.

Commander Mfg. Co., 4233 W. Kinzie St., Chicago 4, Ill.

Buhr Mch. Tool Co., 839 Buhr St., Ann Arbor, Mich.

Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh &, Pa.

Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, S. I., N. Y.

Etco Tool Co., Inc., 592 Johnson Ave., Brooklyn, N. Y.

Ex-Cell-O Corp., 1200 Oakman Blvd., Detrolt 32, Mich.

Moline Tool Co., 102 20th St., Moline, Ill.

Snyder Tool & Engineering Co., 3400 E.

Lafayette, Detroit 7, Mich.

Thriftmaster Products Corp., 1076 N. Plum St.,

Lancaster, Pa.

United States Drill Head Co., 616 Burns,

Cincinnati, Ohio.

Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

DRILL HEADS, Unit Type

Bornes Drill Co., 814 Chestnut, Rockford, III. Commander Mrg. Co., 4233 W. Kinzie St., Barnes Drill Co., 814 Chestnut, Rockford, III.
Commander Mfg. Co., 4233 W. Kinzie St.,
Chicago 4, III.
Delta Power Tool Div., Rockwell Mfg. Co.,
614G N. Lexington Ave., Pittsburgh 8, Pa.
Kingsbury Mch. Tool Corp., Keene, N. H.
Rehnberg-Jacobson Mfg. Co., 2135 Kishwaukee
St., Rockford, III.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, III.

DRILL SOCKETS

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill. Greenfield Top & Die Corp., Greenfield, Mass. Morse Twist Drill & Mch. Co., New Bedford, Mass. National Twist Drill & Tool Co., Rochester, National Twist Drill & 1007 Co., Albah.
Prott & Whitney, West Hartford 1, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland. Ohio.
Union Twist Drill Co., Athol, Mass.

DRILL STANDS

Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio. Greenfield Tap & Die Corp., Greenfield, Mass. Morse Twist Drill & Mch. Co., New Bedford, Mass. National Twist Drill & Tool Co., Rochester, National Twist Drill & Tool Co., Rochester, Mich. Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio. Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio. Union Twist Drill Co., Athol, Mass.

DRILLING ATTACHMENTS, Chip Breaker Type

Commander Mfg. Co., 4233 W. Kinzie St., Chicago 4, III.

DRILLING MACHINES, Automotic

Avey Drilling Machine Co., 25 E. Third St., Covington, Ky. Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohio. Barnes Drill Co., 814 Chestnut, Rockford, Ill. Barnes, W. F. & John, Co., 201 S. Water St., Rackford, Ill.



SIMONDS Now Makes Both Types of Flat Ground DIE STEEL

Simonds offers you a choice of OIL or AIR Hardening DIE STEEL, whichever is best suited to your requirements. Both types are made from Simonds own steel, are precision ground to a thickness limit of plus or minus .001" and have an extra smooth surface finish of 25 to 35 micro inches. Edges and ends are square and parallel, with all scale, decarburation and surface defects removed. All sizes come individually packaged with heat treating instructions.

SIMONDS AIR HARDENING DIE STEEL

(non-deforming 5% Chrome Type) is spherodize annealed for good machinability and uniform hardenability. Its wide hardening range (1700° to 1800° F.) makes it practically foolproof in heat-treating. Stock sizes run from ½" to 2" thick and 2" to 10" wide in 36" lengths.

SIMONDS OIL HARDENING DIE STEEL

(non-deforming Molybdenum Type) is uniformly annealed for easy machining and uniform hardening. Due to its wide hardening range (1450° to 1540°) good results are assured with even the simplest heat treating equipment. Stock sizes are available from \(\frac{1}{6}'' \) to 3" thick and \(\frac{1}{6}'' \) to 14" wide in 18" lengths. The heavier sizes also come in 36" lengths.

Try a bar on your next job. Your Simonds Distributor carries many sizes of both types in stock—call him right now.

SIMONDS SAW AND STEEL CO.

Factory Branches in Beaton, Chicage, San Francisco and Portland, Oregan,
Canadian Factory in Montreal, Que.
Sauthern Service Shop in Mortdlan, Miss. (James), H. Misser San Mfg. Co.)
Simenda Divisionus: Simenda Stol Mill, Lachpur, N. Y.,
Simenda Abrasivo Co., Phila., Pa. and Arvida, Que., Canada



Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass. Bodine Corp., Mt. Grove St., Bridgeport, Conn. Buhr Mch. Tool Co., 839 Buhr St., Ann Arbor, Mich. Consolidated Mch. Tool Corp., Rochester, N. Y. Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn. Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y. Kingsbury Mch. Tool Corp., Keene, N. H. Millholland, W. K., Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind. Morris Machine Tool Co., 9 Harriet St., Cincinati 3, Ohlo. National Automatic Tool Co., Inc., S. 7th and N Sts., Richmond, Ind. Snow Mfg. Co., 435 Eastern Ave, Belwood, Ill. Snyder Tool & Engineering Co., 3400 E. Lafayette, Detroil 7, Mich. Turner Bros., Inc., 2625 Hilton Rd., Ferndale 20, Mich. Wales-Strippit Corp., North Tonawanda, N. Y. Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

DR'LLING MACHINES, Bench

DR:LLING MACHINES, Bench

Atlas Press Co., 1253 No. Pitcher St., Kolamazoo, Mich.

Avey Drilling Machine Co., 25 E. Third St.,
Covington, Ky.

Buffalo Forge Co., 490 Broadway, Buffalo,
N. Y.

Coakley, Cincinnati, Ohio.

Delta Power Tool Div., Rockwell Mfg. Co.,
614G N. Lexington Ave., Pittsburgh 8, Pa.

Dumore Co., 1300 17th St., Rocine, Wis.
Famco Machine Co., 3134 Sheridan Rd.,
Kenosha, Wis.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.

Hamilton Tool Co., 834 South 9th St., Hamilton, Ohio.

Henry & Wright Div., Emhart Mfg. Co., 760
Windsor St., Hartford I, Conn.

Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
South Bend, Lath.

Standard Electrical Tool Co., 2488-90 River Rd.,
Cincinnati 4, Ohio.

Walker-Turner Div., Kearney & Trecker Corp.,
South Ave., Plainfield, N. J.

DRILLING MACHINES, Boiler

Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio. Foote-Burt Co., 1300 St. Clair Ave., Cleveland 8, Ohio.

DRILLING MACHINES, Deep Hole

Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
Morris Machine Tool Co., 9 Harriet St., Cincinnati 3, Ohio.
National Automatic Tool Co., Inc., S. 7th and N Sts., Richmond, Ind.
Pratt & Whitney, West Hartford 1, Conn.
Wales-Strippit Corp., North Tonawanda, N. Y.

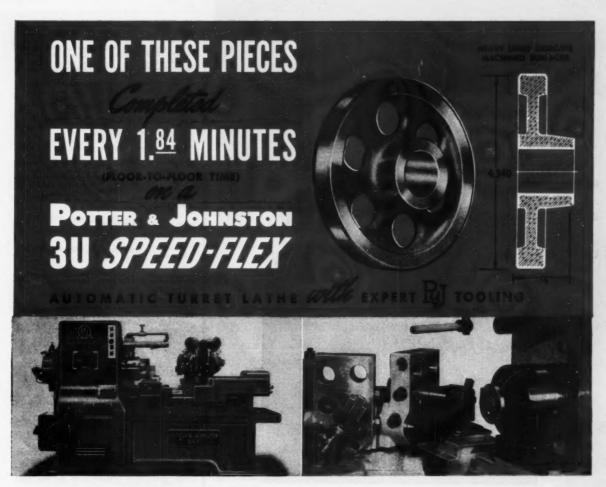
DRILLING MACHINES, Gong

DRILLING MACHINES, Geng
Avey Drilling Machine Co., 25 E. Third St., Covington, Ky.
Baker Bros., Inc., Station F. P. O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Moss.
Cincinnati Bickford Tool Co., Green Bay, Wis., Cincinnati, Ohio.
Cleereman Mch. Tool Corp., Rochester, N. Y.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa. Foote-Burt Co., 1300 St. Clair Ave., Cleveland 8, Ohio.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Iil.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
Millholland, W. K., Mchry, Co., 6402 Westfield Blvd., Indianapolis 5, Ind., Moline Tool Co., 102 20th St., Moline, Ill.
Morris Machine Tool Co., 9 Harriet St., Cincinnati 3, Ohio.
National Automatic Tool Co., Inc., S. 7th and N Sts., Richmond, Ind.
Snyder Tool & Engineering Co., 3400 E. Lafayette, Detroit 7, Mch.

DRILLING MACHINES, **Horizontal Duplex**

Avey Drilling Machine Co., 25 E. Third St., Covington, Ky.

(Continued on page 318)



High output with high precision on difficult jobs is the rule, not the exception, with industry's outstanding production team, Potter & Johnston Automatic Turret Lathes plus P & J Tooling. A job like that shown above is a good example, not because it's unusual, but because it's the sort of work the 3U takes in its stride. All machining operations on these phosphor bronze drive worm wheels are completed in one automatic cycle. They include both inner and outer rim faces as well as the inner end of the hub. Tolerances on some surfaces are held to five ten-thousandths of an inch. One operator easily handles a battery of machines, providing divided labor costs. Production of small, precision parts in your plant can similarly be speeded up — made more efficient. Send now for your copy of Bulletin 145 that fully illustrates and describes the Potter & Johnston 3U Speed-Flex Automatic. Ask P&J Tooling Engineers to make a time and cost estimate for your difficult jobs. They will work out the best possible tooling for better quality, lower costs and fewer rejects — and there is no obligation.

Precision Production Tooling for over 50 years

POTTER & JOHNSTON

PAWTUCKET, RHODE ISLAND



SUBSIDIARY OF PRATT & WHITNE



DIVISION NILES - BEMENT - POND CO

RETTE PLESCY OF CONTACT THE PRATY SWILLTHEY STANDS OFFICE NEADEST YOU BRAINGHAM & BOSTON & CHICAGO & CINCINNATI & CLEVELAND & DETROIT & LOS ANGELES & MEW YORK & PHILADELPHIA & PITTSBURN & ROCHESTER & SAN FRANCISCO & ST. LOUIS & EXPORT DEPT., WEST MARTHORD



11 DIFFERENT STYLES TO CHECK ALL EXTERNAL THREAD ERRORS

nch

erican Standard orth, British Assoc., Acme special thread forms





Pratt & Whitney Roll Thread Snap Gages combine "Go" and "Not Go" annular ribbed gaging rolls in a single unit for detecting all major errors in male threads including Lead, Pitch Diameter, Form, Roundness and Straightness. In operation they are very easy to use, and are much faster than other types. Products are easily gaged right on the nachine without disturbing the work set up.

e two pairs of annular gaging rolls are rotatably mounted and olve freely; wear is evenly distributed around the periphery of the and results in a long accurate life. Each alternate rib on the rolls yed; this prevents the accumulation of chips and dirt that might interfere with the accuracy of the gaging operation.

in addition to interchangeability—is of primary importance parts you manufacture or use, the complete inspection W Roll Thread Snap Gages will assure you of new and dependability. For more complete information, Bulletin No. 498. Just write on your Company Whitney Branch Office nearest you or direct



PRATT & WHITNEY

DIVISION NILES-BEMENT-POND COMPANY WEST HARTFORD 1, CONNECTICUT, U.S.A.



CUTTING TOOLS . GAGES . MACHINE TOOLS

Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohio. Barnes Drill Co., 814 Chestnut, Rackford, Ill. Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill. Bush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Consolidated Mch. Tool Corp., Rochester, N. Y. Davis & Thompson Co., 6411 W. Burnham St., Milwaukee 14, Wis.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Po. Kingsbury Mch. Tool Corp., Keene, N. H. Millholland, W. K., Mchry. Co., 6402 Westfield Blvd., Indianapolis 5, Ind. Moline Tool Co., 102 20th St., Moline, Ill. Morris Machine Tool Co., 9 Harriet St., Cincinnati 3, Ohio.
Notional Automatic Tool Co., Inc., S. 7th and N Sts., Richmond, Ind.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill. Snyder Tool & Engineering Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

DRILLING MACHINES, **Horizontal Portable**

Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohlo.

DRILLING MACHINES, Inverted

Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohio. Barnes Drill Co., 814 Chestnut, Rockford, III. Baush Machine Tool Co., 155 Wason Ave., Springfield 7, Mass. National Automatic Tool Co., Inc., S. 7th and N Sts., Richmond, Ind. Snyder Tool & Engineering Co., 3400 E. Lafayette, Detroit 7, Mich.

DRILLING MACHINES, Multiple Center Column Type

Barnes Drill Co., 814 Chestnut, Rockford, III. Morris Machine Tool Co., 9 Harriet St., Cin-cinnati 3, Ohio. National Automatic Tool Co., Inc., S. 7th and N Sts., Richmond, Ind.

DRILLING MACHINES, Multiple Spindle

DRILLING MACHINES, Multiple Spindle
Avey Drilling Machine Co., 25 E. Third St.,
Covington, Ky.
Baker Bros., Inc., Station F, P. O. Box 101,
Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, III.
Barnes, W. F. & John, Co., 201 S. Water St.,
Rockford, III.
Baush Machine Tool Co., 156 Wason Ave.,
Springfield 7, Mass.
Buffalo Forge Co., 490 Broadway, Buffalo,
N. Y.
Buhr Mch. Tool Co., 839 Buhr St., Ann Arbor,
Mich.
Burg Tool Manufacturing Co., 3743 Durango
Ave., Los Angeles 34, Calif.
Canedy-Otto Div., Cincinnati Lathe & Tool Co.,
Oakley, Cincinnati, Ohio.
Cincinnati, Ohio.
Cincinnati Bickford Tool Co., 3220 Forrer Ave.,
Cincinnati, Ohio.
Cleereman Mch. Tool Co., Green Bay, Wis.
Cosa Corp., 405 Lexington Ave., New York 17,
N. Y.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Davis & Thompson Co., 6411 W. Burnham St.,
Milwaukee 14, Wis.
Delta Power Tool Div., Rockwell Mfg. Co.,
614G N. Lexington Ave., Pittsburgh B, Pa.,
Famco Machine Co., 3134 Sheridan Rd.,
Kenosha, Wis.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Greenlee Bros. & Co., 12th and Columbia Ave.,
Rockford, III.
Hartford Special Mchry. Co., 287 Homestead
St., Hartford, Conn.
Henry & Wright Div., Emhart Mfg. Co., 760
Windsor St., Hartford 1, Conn.
Ingersoll Milling Mch. Co., 2442 Douglas St.,
Rockford, III.
Kingsbury Mch. Tool Corp., Keene, N. H.
Leiand-Gifford Co., 1025 Southbridge St., Worcester, Mass.,
Aillholland, W. K., Mchry. Co., 6402 Westfield
Blvd., Indianapolis 5, Ind.
Moline Tool Co., 102, 700, 111.
Norris Machine Tool Co., 102, 111.
No

DRILLING MACHINES, Radial

DRILLING MACHINES, Radial

American Tool Works Co., Pearl and Eggleston
Ave., Cincinnati, Ohio.

British Industries Corp.. International Mchry.
Div., 164 Duane St., New York, N. Y.
Conedy-Otto Div. C. on neart Latine & Tool Co.,
Oakley, Cincinnati, Ohio.
Carlton Mch. Tool Co., 3000 Spring Grove Ave.,
Cincinnati Bickford Tool Co., 3220 Forrer Ave.,
Cincinnati Bickford Tool Co., 3220 Forrer Ave.,
Cincinnati Gilbert Machine Tool Co., 3366
Beekman St., Cincinnati 83, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17,
N. Y.
Foote-Burt Co., 1300 St. Clair Ave., Cleveland
8, Ohio.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Morris Machine Tool Co., 9 Harriet St., Cincinnati 3, Ohio.
Onsrud Machine Works, Inc., 3940 Palmer St.,
Chicago, III.

DRILLING MACHINES, Roil

See Drilling Machines, Gang.

DRILLING MACHINES, Sensitive

Atlas Press Co., 1253 No. Pitcher St., Kalamazoo, Mich.
Avey Drilling Machine Co., 25 E. Third St.,
Covington, Ky.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Canedy-Otto Div., Cincinnati Lathe & Tool Co.,
Oakley, Cincinnati, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17,
N. Y. Third St., Control Control Control Control N. Y.
Delta Power Tool Div., Rockwell Mfg. Co.,
614G N. Lexington Ave., Pittsburgh 8, Pa.
Famco Machine Co., 3134 Sheridan Rd.,
Kenosha, Wis.
Foote-Burt Co., 1300 St. Clair Ave., Cleveland Foote-Burt Co., 1300 St. Clair Ave., Cleveland 8, Ohio. Fosdick Mch. Tool Co., 1638 Blue Rock, Cin-cinnati 23, Ohio. Hamilton Tool Co., 834 South 9th St., Hamil-ton, Ohio. Henry & Wright Div., Emhart Mfg. Co., 760 Windsor St., Hartford 1, Conn. Leland-Gifford Co., 1025 Southbridge St., Wor-cester. Mass Leland-Gifford Co., 1025 Southbridge St., Wor-cester, Mass.
Morris Machine Tool Co., 9 Harriet St., Cin-cinnati 3, Ohio.
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.
Pratt & Whitney, West Hartford 1, Conn. Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, III.
Snow Mfq. Co., 435 Eastern Ave., Bellwood, III. Wales-Strippit Corp., North Tonawanda, N. Y.

DRILLING MACHINES, Upright

DRILLING MACHINES, Upright
Atlas Press Co., 1253 No. Pitcher St., Kalamazoo, Mich.
Avey Drilling Machine Co., 25 E. Third St.,
Covington, Ky.
Baker Bros., Inc., Station F, P. O. Box 101,
Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St.,
Rockford, Ill.
Baush Mch. Tool Co., 156 Wasan Ave., Springfield 7, Mass.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Canedy-Otto Div., Cincinnati Lathe & Tool Co.,
Oakley, Cincinnati, Ohio.
Cincinnati Bickford Tool Co., 3220 Forrer Ave.,
Cincinnati, Ohio. Canedy-Otto Div., Cincinnati Lathe & Tool Co., Oakley, Cincinnati, Ohio.
Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.
Cleereman Mch. Tool Co., Green Bay, Wis.
Consolidated Mch. Tool Co., Green Bay, Wis.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Coxa Corp., 405 Lexington Ave., New York 17, N. Y.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh & Po., 614G N. Lexington Ave., Pittsburgh & Po., 614G N. Lexington Ave., Cleveland & Ohio.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Hartford, Conn.
Ingersoll Milling Mch. Co., 287 Homestead St., Hartford, Conn.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, III.
Leiand-Gifford Co., 1025 Southbridge St., Worcester, Mass.
Moline Tool Co., 102 20th St., Moline, III.
Morris Machine Tool Co., 9 Harriet St., Cincinnati 3, Ohio.
National Automatic Tool Co., Inc., S. 7th and N Sts., Richmond, Ind.
Netse, Karl A., Dept. M, 381 Fourth Ave., New York 15, N. Y.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Rehnberg-Jacobson Mfg. Co., 2135 Kishwaukee St., Rockford, III.
Rogers Machine Works, Inc., Buffalo 10, N. Y.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, III.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, II

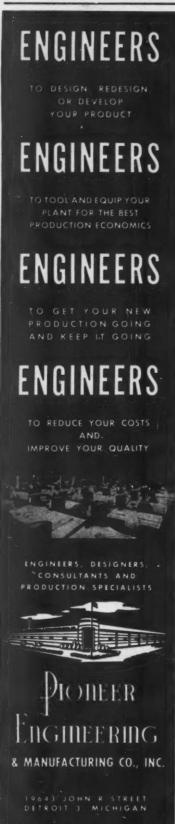
(Continued on page 320)

PRATT & WHITNEY PRATT & WHITNEY for UNIFIED and AMERICAN STANDARD THREADS

The exclusive Pratt & Whitney thread lapping process assures high accuracy and produces uniform, smooth surfaces that improve feel and greatly increase resistance to wear. This precision and long life are not possible in gages produced by grinding alone

Lasting accuracy also demands the finest materials. Pratt & Whitney Thread Plug and Ring Gages are made from selected alloys having at least twice the wear resistance of ordinary gage steels. Special P & W heat treating processes produce proper hardness to insure maximum wear resistance and long life. For 100% inspection on large production jobs and for other applications involving severe wear, P & W Carbide Gages are recommended; they will outwear several steel gages and soon pay for themselves in lower costs per piece gaged.





DRILLING MACHINES, Well Rediel

Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cieveland, Ohio. Consolidated Mch. Tool Corp., Rochester, N. Y.

Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio. Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich. Greenfield Tap & Die Corp., Greenfield Mass. Keo Cutters, 19326 Woodward, Detroit, Mich. Mass. Twist Drill & Mch. Co., New Bedford, Mass.
Notional Twist Drill & Tool Co., Rochester, Mich.

Mich.
Standard Zool Co., 3950 Chester Ave., Cleveland, Ohio.
Union Twist Drill Co., Athol. Mass.
Warner & Swasey Co., 5701 Carnegle Ave.,
Cleveland 3, Ohio.

DRILLS, Core

Adamos Carbide Corp., 999 South 4th St., Harrison N. J.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Erickson Tools Div., Erickson Steel Co., 2309 Hamilton, Cieveland, Ohio.
Ex-Cell-O Corp., 1200 Oakman Bivd., Detroit 32, Mich.
Firth-Sterling Inc., McKeesport, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Havnes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa. ville, Pa.

Marse Twist Drill & Mch. Co., New Bedford,
Mars.

National Twist Drill & Tool Co., Rochester, Mich. Mich. Tool Co., 21650 Hoover Rd., Detroit 13, Micr.,
Super Tool Co., 21000 ...
Mich.
Union Twist Drill Co., Athol, Mass.
Wesson Co., 1220 Woodward Heights Blvd.,
Ferndale, Mich.
Willey's Carbide Tool Co., 1340 W. Vernor
Hwy., Detroit 1, Mich.

DRILLS, Deep Hole

Pratt & Whitney, West Hartford 1, Conn. Union Twist Drill Co., Athol, Mass.

DRILLS, Portable Electric

Black & Decker Mfg. Co., Towson, Md.
Chicago Pneumatic Tool Co., 6 E. 44th St.,
New York, N. Y.
Dumore Co., 1300 17th St., Racine, Wis.
Millers Falls Co., Greenfield, Mass.
Ryerson, Jos. T. & Son, Inc., 2558 W. 16th St.,
Chicago 18. III.
Skil Corp., 5039 Elston Ave., Chicago, III.
Standard Electrical Tool Co., 2488-90 River Rd.,
Cincinnati 4, Ohio.

DRILLS, Portable Pneumatic

Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y. Ingersoll-Rand Co., Phillipsburg, N. J. Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, III.

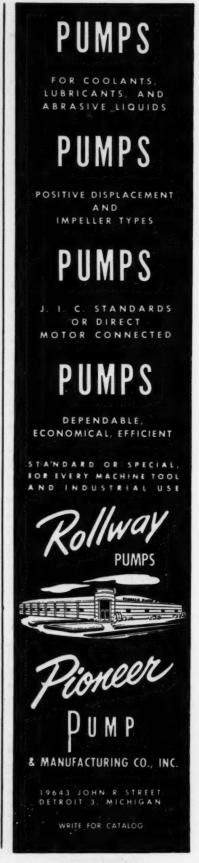
DRILLS, Ratchet

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, III.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Rochester, Mich. Mich.
Pratt & Whitney, West Hartford 1, Conn.
Union Twist Drill Co., Athol, Mass.

DRILLS, Twist

Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Firth-Sterling Inc., McKeesport, Pa.
Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Prott & Whitney, West Hartford 1, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Union Twist Drill Co., Athol, Mass.

(Continued on page 322)

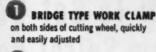




CAMPBELL ABRASIVE CUTTERS

Have you checked on Abrasive Cutting lately?

Improved Campbell No. 406
Cutter offers these features:



WHEEL GUIDES for more accurate cuts... reduces wheel flutter

3 CUTTING WHEEL OSCILLATION for quality cutting over 2" diameter solids

LOW PRESSURE SELF-CONTAINED HYDRAULIC SYSTEM for operating controls

SIMPLIFIED, RUGGED COOLANT
DISTRIBUTOR to insure adequate supply
of coolant on both sides of cutting wheel

COMPLETELY ENCLOSED
CUTTING WHEEL for operator's safety

SEPARATE COOLANT TANK
...large capacity ... may be easily removed for cleaning

8 EXTRA-LARGE CAPACITY
COOLANT PUMP

—plus many other valuable features!

CAMPBELLS Save You Money

• Even old model abrasive cutters made big savings by reducing the cut-off time per piece, but the new improved CAMPBELL Abrasive Cutters—with their many new time and effort reducing features—show still greater efficiency and savings. CAMPBELLS pay for themselves out of savings.

Check the methods and equipment you use. On many jobs cutting time can be reduced up to 75%. Machines can be furnished in fully automatic or semi-automatic types.

Write today for Bulletin **DH-260** which tells you how to modernize your cutting procedure with a CAMPBELL 406. Then give us details of the job to be done so we can make recommendations and quote prices.

ACCO

CAMPBELL MACHINE DIVISION AMERICAN CHAIN & CABLE

925 Connecticut Ave., Bridgeport 2, Conn.

CAMPBELL

Abrasive Cutters and Nibblers

DRILLS, Wire

Greenfield Tap & Die Corp., Greenfield, Mass. Marse Twist Drill & Mch. Co., New Bedford, Mass. National Twist Drill & Tool Co., Rochester, National Twist Urill Mich. Standard Tool Co., 3950 Chester Ave., Cleve-land, Ohio. Union Twist Drill Co., Athol, Mass.

DUPLICATORS

Gorton, George, Mch. Co., 1110 W. 13th St., Racine, Wis. Prott & Whitney, West Hartford 1, Conn. Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, III. Turchan Follower Mch. Co., 8259 Livernois, Detroit, Mich.

DUST COLLECTORS

Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.

DUST CONTROL SYSTEMS

American Air Filter Co., Inc., Louisville, Ky. Leiman Bros., Inc., 156 Christie St., Newark, N. J. Pangborn Corp., Hagerstown, Md. Torit Mfg Co., 307 Walnut St., St. Paul 2, Minn.

ELECTRICAL EQUIPMENT

General Electric Co., Schenectady 5, N. Y.

EMERY WHEEL DRESSERS

See Dressers, Grinding Wheel.

EMERY WHEELS

See Grinding Wheels.

ENGRAVING MACHINES

British Industries Corp., International Mchry. Div., 164 Duane St., New York. Cosa Corp., 405 Lexington Ave., New York 17, N. Y., Gorton, George, Mch. Co., 1110 W. 13th St., Racine, Wis.

EXTRACTORS, Screw

Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio. Greenfield Tap & Die Corp., Greenfield, Mass. Morse Twist Drill & Mch. Co., New Bedford, Mass. Union Twist Drill Co., Athol, Mass.

FACING MACHINES

Ex-Cell-O Corp., 1200 Oakman Bivd., Detroit 32, Mich. National Automatic Tool Co., Inc., S. 7th and N Sts., Richmond, Ind.

FANS, Exhaust, Electric Ventilating

Buffalo Forge Co., 490 Broadway, Buffalo, N. Y. General Electric Co., Schenectady 5, N. Y.

FEEDS FOR PRESSES, Automotic

Federal Press Co., 600 Division and Big Four R. R., Elkhart, Ind. Nilson, A. H., Mch. Co., 1506 Railroad Ave., Bridgeport, Conn. U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J. V & O Press Co., Div. Emhart Mfg. Co., Hudson, N. Y.

FELT, For All Applications

American Felt Co., Glenville, Conn.

DoAll Co., 254 Laurel Ave., Des Plaines, III. Simonds Saw & Steel Co., 470 Main St., Fitch-burg, Mass.

FILES, Hand

Atkins, E. C., & Co., 402 South Illinois St., Indianapolis 9, Ind. DoAli Co., 254 Laurel Ave., Des Plaines, Ill. Heller Bros. Co., Newcomerstown, Ohio. Nicholson File Co., 23 Acorn St., Providence, R. I. K. I. Severance Tool Industries, Inc., 636 Iowa Ave., Saginaw, Mich. Simonds Saw & Steel Co., 470 Main St., Fitch-burg, Mass.

Atkins, E. C., & Co., 402 South Illinois St., Indianapolis 9, Ind. DoAll Co., 254 Laurel Ave., Des Plaines, Ill. Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.

FILES AND BURS, Retary

Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Ford, M. A., Mfg. Co., 7401 W. 1st St., Davenport, Iowa.
Jarvis, Chas. L., Co., Middletown, Conn.
Pratt & Whitney, West Hartford J. Conn.
Severance Tool Industries, Inc., 636 Iowa Ave., Saginaw, Mich.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

FILING MACHINES, Dies, Etc.

DoAll Co., 254 Laurel Ave., Des Plaines, Ill. Grob Bros., Grafton, Wis. Hirschmann, Carl, Co., 30 Park Ave., Man-hasset, N. Y. Jarvis, Chas. L., Co., Middletown, Conn. Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.

FILTERS. Air

American Air Filter Co., Inc., Louisville, Ky.

FILTERS, Coolant and Oil

Bowser, Inc., 1365 E. Creighton Ave., Fort Wayne, Ind. Cuno Engrg. Corp., Meriden, Conn. (Continued on page 324)

How To Get Better Results From Spiral Point Taps

Although spiral point taps are preferred for many operations, their use often presents sharpening problems. In fact, many manufacturers have purposely neglected to use spiral points because of the difficulty of sharpening them as accurately as required.

PRECISION SHARPENING OFFERS SOLUTION

A proven method of precision tap sharpening now enables manufacturers to enjoy the benefits of spiral point taps without sharpening difficulties. This sharpening method involves the use of the Blake Flute Grinder and Blake Chamfer Grinder. It enables each spiral point tap to be ground uniformly to the accuracy required for efficient and productive operation. Each tap can be sharpened precisely to provide uniform depth, uniform length, and uniform indexing. The superior sharpening results obtained from Blake tap sharpening equipment make possible far greater production per tap; longer tap life, and greatly reduced tap breakage.



REQUIREMENTS FOR PRECISION SHARPENING! Photograph shows workhead of Blake Flute Grinder in correct angle position for accurate grinding of spiral point taps.

MORE FACTS IN TRADE PAPER ARTICLE

For a more thorough treatment of this subject, read the recent Machinery article, "Why Taps Should Be Sharpened Precisely". If you would like a reprint of this article for future reference, write us for your free copy. Illustrated bulletins which describe both Blake machines are also available. Ask for them!

IT'S A FACT! YOU CAN REDUCE YOUR TAP COSTS 50 to 75% by installing Blake tap sharpening equipment and sharpening your taps as you do other metal cutting tools.

PUT THIS COST-CUTTING COMBINATION TO WORK FOR YOU NOW!



ACCURATE, TRUE-CUTTING TAPS LESS TAP BREAKAGE 600% MORE PRODUCTION PER TAP UP TO 75% REDUCTION IN TAP COSTS

EDWARD BLAKE COMPANY 442 CHERRY ST., WEST NEWTON 65

"where can I get a good, small general purpose hydraulic press...quickly?"

"HANNIFIN HAS THEM FROM I TO IO TONS FOR PROMPT DELIVERY!

Yes, Hannifin is your best source for small, general purpose hydraulic presses. And, you can get almost immediate delivery because the demand for these popular presses is so consistent that Hannifin is able to make them in quantity.

This continuous quantity production works to your advantage price-wise, too, because the savings of volume production are passed along.

The quality of these small presses is identical to that of the larger Hannifin presses that are built to order. Fast acting, single-lever and dual-lever manual controls are standard, but optional controls, including Hannifin's patented Sensitive Pressure Controls, are available on the 5-, 8- and 10-ton models. Maximum pressure can be adjusted from 10% of capacity to full capacity on all models.

select the press you need from this chart...

					-	PRICEPRU
CAPACITY, tons	1-ton	2-ton	5-ton	8-ton	10-ton	SEN REU
MODEL NUMBER	F-70	F-20	F-50	F-80	F-101	or alle
RAM SPEED (inmin.) Do	wn 400 800	190 345	120* 240*	73° 151°	130 254	CHET BULLET
PUMP (gpm.)	3.3	3.3	5*	5*	11	THE OF
MOTOR (hp)	11/6	135	2*	2*	5	NA NA
STROKE (in.)		6	10	10	12	W.
GAP (in.)	10	10	16	16	22	
REACH (in.)	6	6	71/2	71/4	10	
BULLETIN	H-784	H-784	135	135	134	

*Supplied with larger motor and pump when higher ram speed is required.

Hannifin Representatives Are at Your Service in These Leading Industrial Centers

Attente, Buffelo, Cincinneti, Clevoland, Dellos, Dayton, Denvor, Detroit, Houston, Los Angelos, Milweukse, Minneapolis, Moline, Naw Orleans, New York, Philadelphia, Pittsburgh, St. Louis, Seattle; Richmond, Va.; Rochester, N. Y.; Seuth Bond, Ind.; Washington, D. C.; Worcester, Mass. In Canada: TEM Sales Company, Torento

HANNIFIN

Hydraulic and Pneumatic Presses from ½ Ton to 150 Tons Air and Hydraulic Cylinders • Riveters • Air Control Valves

mail the coupon!

1109 S. Kil Please send															w	it	h		×	ic	æ	8	2			
☐ Bulletin	H-78	14		1	1	Bı	al	le	ti	n	1	3	5		1			B	u	11	e	ti	n	1	3	4
Name			 								ě					•						0				
Position																										
Company			 																							
Address			 																							
City									.!	Se	at	e.		 												

FINISHES FOR MACHINES AND METAL

Lowe Bres. Co., Dayton, Ohio.

FLEXIBLE COUPLINGS

See Couplings, Flexible.

FLEXIBLE SHAFT EQUIPMENT

Dumore Co., 1300 17th St., Racine, Wis. Jarvis, Chas. L., Co., Middlefown, Conn. Neise, Karl A., Dept. M., 381 Fourth Ave., New York 18, N. Y.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Prait & Whitney, West Hartford 1, Conn. Wolker-Turner Div., Kearney & Trecker Corp., South Ave., Plainfield, N. J.

FORGING (Upsetting) MACHINES

Ajax Mfg. Co., Euclid, Cleveland 17, Ohio. Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.

Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio. National Machinery Co., Greenfield and Stanton Sts., Tiffin, Ohio.

FORGINGS, Drop

Bethlehem Steel Co., Bethlehem, Pa. Kropp Forge Co., 5301 W. Roosevelt Rd., Chicago 50, III. Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

FORG!NGS, Hollow Bored

Bethlehem Steel Co., Bethlehem, Pa. National Forge & Ordnance Co., Irvine, Warren County, Pa.

FORGINGS, Iron and Steel

Bethlehem Steel Co., Bethlehem, Pa. Kropp Forge Co., 5301 W. Roosevelt Rd., Chicago 50, III.

Morgan Engrg. Co., Alliance, Ohie. National Forge & Ordnance Co., Irvine, Warren County, Pa.

FORGINGS, Upset

Bethlehem Steel Co., Bethlehem, Pa. Krope Forge Co., 5301 W. Roosevelt Rd., Chicago 50, Ill. Williams, J. H., & Co., 400 Vulcan St., Buffale 7, N. Y.

FORMING AND BENDING MACHINES

American Steel Foundries, Elmes Engry, Davidock Rd. and Tennessee Ave., Cincinnati, Ohio.

Boldwin-Lima-Hamilton Corp., Philodelphia 42, Boldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Bath, Cyril, Co., 6984 Machinery Ave., Cleveland 3, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Chambersburg Engra, Co., Chambersburg, Pa.
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Cleveland Punch & Shear Works Co., 3917 St.
Clair Ave., N. E., Cleveland, Ohio.
Columbia Machinery & Engineering Corp., Hamilton 1, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Dreis & Krump Mfg. Co., 7416 Loomis Bivd., Chicago 36, Ill.
Ferrocute Machine Co., Bridgeton, N. J.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago,
Ill. III.
Hufford Machine Works, Inc., 1700 E. Grand
Ave., El Segundo, Calif. (Stretch-Wrap).
Hydraulic Press Mfg. Co., 300 Lincoln Ave.,
Mt. Gilcod, Ohio.
Niagara Mch. & Tool Works, 683 Northland
Ave., Buffalo, N. Y.
O'Neil-I-win Mfg. Co., Lake City, Minn.
Yoder Co., 5500 Walworth, Cleveland, Ohio.

FORMING AND STAMPING MACHINES

Chambersburg Engrg. Co., Chambersburg, Pa. Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio. Dreis & Krump Mfg. Co., 7416 Loomis Blvd., Chicago 36, Ill. Henry & Wright Div., Emhart Mfg. Co., 760 Windsor St., Hartford 1, Conn. Hydrauiic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio. Hydrospress, Inc., 350 Fifth Ave., New York 1, N. Y. Niggara Mch. & Tool Works. 483 Northland N. Y.
Niggara Mch. & Tool Works, 683 Northland
Ave., Buffalo, N. Y.
Nilson, A. H., Mch. Co., 1506 Rollrood Ave.,
Bridgeport, Conn.
U. S. Tool Co., Inc., 255 North 18th St.,
Ampere, N. J.
V & O Press Co., Div. Emhart Mfg. Co.,
Hudson, N. Y.

FORMING TOOLS or Tool Blanks

Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.
Brown & Sharpe Mfg. Co., Providence, R. I.
Brown & Sharpe Mfg. Corp., 20
Brothing Inc., McKeesport, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Havnes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Kennametal, Inc., Latrobe, Pa.
National Broach & Mch. Co., 5600 St. Jean
Ave., Detroit 2, Mich.
Praft & Whitney. West Hartford 1, Conn.
Wesson Co., 1220 Woodward Heights Blvd.,
Ferndale, Mich.

FRAMES, Machinery Welded

Mahon, R. H., Co., Detroit 34, Mich.

FURNACES, Heat Treating

General Electric Co., Schenectady 5, N. Y.

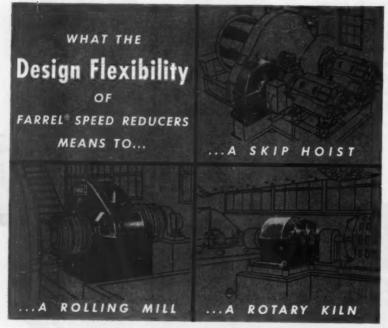
FURNITURE, Shop

Standard Pressed Steel Co, Jenkintown, Pa.

GAGE BLOCKS

Brown & Sharpe Mfg. Co., Providence, R. I. DoAll Co., 254 Laurel Aves., Des Plaines, III. Prott & Whitney, West Hartford 1, Conn. Scherr, George, Co., Inc., 200 Lafayette St, New York 12, N. Y. Taft-Peitce Mfg. Co., Woomscket, R. I. Van Keuren Co., 176 Watham St., Watertown, Boston, Mass. Webber Gage Co., 12909 Triskett Rd., Cleveland 11, Ohio.

(Continued on page 326)





Design flexibility means the same thing in each of these applications: a speed reducer that meets the drive requirements exactly.

Farrel speed reducers, unlike most "standardized" products, are standard only in their principal features. They are adaptable in critical detail. Gears, shafts, bearings, and even some housing dimensions, can be proportioned to meet specific load, speed and service requirements. This flexibility has resulted in the solution of innumerable application problems.

Write for further details of these problem-solv-

ing units. Ask for a copy of Bulletin 449.

FARREL-BIRMINGHAM COMPANY, Inc., Ansonia, Conn.

Plants: Ansonia and Derby, Conn., Buffalo, N. Y.
Sales Offices: Ansonia, Buffalo, New York, Boston, Pitts-burgh, Akron, Detroit, Chicago, Memphis, Minneapolis, Portland (Oregon), Los Angeles, Salt Lake City, Tulsa, Houston, New Orleans.

Farrel-Birmingham

Heavy Duty Drilling?

HERE'S YOUR ANSWER!!

The Baush W-8 Drilling Machine illustrated is drilling $17-34^{\prime\prime}$ diameter holes, in one operation, in CAST STEEL.

Baush W-Type Drilling Machines

have always been known for their time-saving operation, rugged construction, and an ability to handle the heaviest jobs day-in and day-out — and do it for years with minimum maintenance.

Unit shown is equipped with a 30 H.P. Spindle Drive Motor, has a $24^{\prime\prime}$ x $30^{\prime\prime}$ rectangular, joint-driven type head with master-bored cluster plate that is bored for, and furnished with, $17-3^{\prime\prime}$ diameter slip-sleeve type spindles.

Part being drilled is loaded into work-holding pallet as shown in photo. Pallet is located and clamped in each machine proper, as a progressive sequence of operations is performed on this part while it travels through a battery of different units — of which the W-8 Unit shown is one.

BAUSH
MACHINE TOOL CO.
SPRINGFIELD 7, MASSACHUSETTS

Write, wire or 'phone your drilling problems to us.

GAGES, Air

DoAll Co., 254 Laurel Aves., Des Plaines, III. Federal Products Corp., P. O. Box 1027, Provi-dence, R. I. dence, R. I.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

GAGES, Comparator

Ames, B. C., Co., Waltham 54, Mass.

«Comtor Co., 47 Farwell St., Waltham 54, Mass.

DoAll Co., 254 Laurel Ave., Des Plaines, Ill.

Federal Products Corp., P. O. Box 1027, Providence, R. I.

Jones & Lamson Mch. Co., 160 Clinton St.,

Springfield, Vt.

Neise, Karl A., Dept. M., 381 Fourth Ave.,

New York 16, N. Y.

Pratt & Whitney, West Hartford 1, Conn.

Scherr, George, Co., Inc., 200 Lafayette St.,

New York 12, N. Y.

Sheffield Corp., 721 Springfield, Dayton, Ohio.

Standard Gage Co., Inc., Poughkeepsie, N. Y.

Surface Checking Gage Co., 5864 Hollywood

Blvd., Hollywood 28, Calif.

Taft-Peirce Mfg. Co., Woonsacket, R. I.

GAGES, Depth

Ames, B. C., Co. (Dial), Waitham 54, Mass. Brown & Sharpe Mfg. Co., Providence, R. I. DoAll Co., 254 Laurei Ave, Des Plaines, Ill. Federal Products Corp., P. O. Box 1027, Providence, R. I. Millers Falls Co., Greenfield, Mass. Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y. Sheffield Corp., 721 Springfield, Dayton, Ohio. Standard Gage Co., Inc., Poughkeepsie, N. Y. Starrett, The L. S., Co., Athol, Mass.

GAGES, Diel

Ames, B. C., Co., Waitham 54, Mass.
Bristol Co., Platts Mills, Waterbury, Conn.
Brown & Sharoe Mfg. Co., Providence, R. I.
DoAll Co., 254 Laurel Ave., Des Plaines, III.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Neise, Karl A., Dept. M, 381 Fourth Ave.,
New York 16, N. Y.
Scherr, George, Co., Inc., 200 Lafayette St.,
New York 12, N. Y.

Sheffield Corp., 721 Springfield, Dayton, Ohio. Standard Gage Co., Inc., Poughkeepsie, N. Y. Starrett, The L. S., Co., Athol, Mass.

GAGES, Electric

DoAll Co., 254 Laurel Ave., Des Plaines, III. Federal Products Corp., P. O. Box 1027, Provi-dence, R. I. Pratt & Whitney, West Hartford 1, Conn. Sheffield Corp., 721 Springfield, Dayton, Ohio.

GAGES, Height

Ames, B.C., Co., Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
DoAll Co., 254 Laurel Ave., Des Plaines, III.
Homestrand, Inc., Larchmont, N. Y.
Neise, Karl A., Dept. M., 381 Fourth Ave.,
New York 16, N. Y.
Pratt & Whitney, West Hartford I, Conn.
Scherr, George, Co., Inc., 200 Larayette St.,
New York 12, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Starrett, The L. S., Co., Athol, Mass.

GAGES, Plug, Ring and Snap

Axelson Mfg. Co., P. O. Box 15335, Vernon Sta., Los Angeles 58, Colif. Brown & Sharpe Mfg. Co., Providence, R. I. Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich. DoAll Co., 254 Laurel Ave., Des Plaines, III. Federal Products Corp., P. O. Box 1027, Providence, R. I. Firth-Sterling Inc., McKeesport, Pa. Greenfield Top & Die Corp., Greenfield, Mass. Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York. Kennomertal, Inc., Latrobe, Pa. Metal Carbides Corp., Youngstown, Pa. Morse Twist Drill & Mch. Co., New Bedford, Mass. Mass.
Pratt & Whitney, West Hartford I, Conn.
Scherr, George, Co., Inc., 200 Lafayette St.,
New York 12, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Starrett, The L. S., Co., Athol, Mass.
Turner Bros., Inc., 2625 Hilton Rd., Ferndale
20. Mich. Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass.

Vinco Corp., 8855 Schaefer Highway, Detroit 27, Mich. Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich. Woodworth, N. A., Co., 1300 E. Nine Mile Rd., Detroit 20, Mich.

GAGES, Surface

Ames, B. C., Co., Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Columbus Die-Tool & Mch. Co., 955 Cleveland
Ave., Columbus, Ohio.
DoAll Co., 254 Laurel Ave., Des Plaines, III.
Millers Falls Co., Greenfield, Mass.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Starrett, The L. S., Co., Athol, Mass.
Surface Checking Gage Co., 5864 Hollywood
Blvd., Hollywood 28, Calif.

GAGES, Toper

Brown & Sharpe Mfg. Co., Providence, R. I. DoAll Co., 254 Laurel Ave., Des Plaines, III. Engls Equipment Co., 431 S. Dearborn St., Chicago S. III. Pratt & Whitney, West Hartford 1, Conn. Sheffield Corp., 721 Springfield, Dayton, Ohio. Starrett, The L. S., Co., Athol, Mass. Vinco Corp., 8855 Schaefer Highway, Detroit 27, Mich.

GAGES, Thread

Axelson Mfg. Co., P. O. Box 15335, Vernon Sta., Los Angeles 58, Calif. Bath, John, Co., Inc., Worcester, Mass. Detroit Tap & Tool Co., Detroit, Mich. DoAll Co., 254 Laurel Ave., Des Plaines, III. Federal Products Corp., P. O. Box 1027, Providence, R. I. Greenfield Tap & Die Corp., Greenfield, Mass. Pratt & Whitney, West Hartford 1, Conn. Sheffield Corp., 721 Springfield, Dayton, Ohio. Taft-Peirce Mfg. Co., Woonsocket, R. I. Vinco Corp., 8855 Schaefer Highway, Detroit 27, Mich. Woodworth, N. A., Co., 1300 E. Nine Mile Rd., Detroit 20, Mich.

GASKETS

Crane Packing Co., 1800 Cuyler Ave., Chicago, Garlock Packing Co., Palmyra, N. Y.

GEAR BLANKS, Non-Metallic

Braun Gear Co., 239 Richmond, Brooklyn 8, N. Y. General Electric Co., Schenectady 5, N. Y.

GEAR BURNISHING MACHINES

Fellows Gear Shaper Co., 78 River St., Spring-field, Vt. Sheffield Corp., 721 Springfield, Dayton, Ohio.

GEAR CHAMFERING, ROUNDING AND BURRING MACHINES

Bilgram Gear & Mch. Works, 1217-35 Spring Garden St., Philadelphia, Pa. Consolidated Mch. Tool Corp., Rochester, N. Y. Cross Co., 3250 Bellevue Ave., Detroit 7, Mich. Lipe-Rollway Corp., 806 Emerson Ave., Syra-cuse, N. Y. Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y. Sheffield Corp., 721 Springfield, Dayton, Ohio.

GEAR CHECKING INSTRUMENTS AND EQUIPMENT

AND EQUIPMENT

Brown & Sharpe Mfg. Co., Providence, R. I.
Eastman Kodak Co., Rochester, N. Y.
Fellows Gear Shaper Co., 78 River St., Springfield, Vf.
Gleason Works, 1000 University Ave., Rochester
3, N. Y.
Michigan Tool Co., 7173 E. McNichols Rd.,
Detroit 12, Mich.
National Broach & Mch. Co., 5600 St. Jean
Ave., Detroit 2, Mich.
Scherr, George, Co., Inc., 200 Lafayette St.,
New York 12, N. Y.
Starrett, The L. S., Co., Athol, Mass.
Vinco Corp., 8855 Schaefer Highway, Detroit
27, Mich.

GEAR CUTTING MACHINES, Bevel Gears (Generators)

Bilgram Gear & Mch. Works, 1217-35 Spring Garden St., Philadelphia, Pa. Gleason Works, 1000 University Ave., Rochester 3, N. Y.

(Continued on page 328)



Designed for Two, but Handling Three, PROVES THE ABILITY of this

TORIT DUST SEPARATOR



Torit Dust Collectors are available in both cabinet and cyclone types, in sizes ranging up to 5 h.p.



Practically 100% dust collection is attained in the set-up pictured here, even though the bench grinder was added to the system originally installed to serve just the large pedestal grinder.

just the large pedestal grinder.

Torit Dust Separators have ample capacity. Compactly designed they easily fit into present, or future, production largouts. A minimum of piping reduces operational losses and does not block off light or heating sources. Maintenance and power consumption are exceptionally low for machines and separator start and stop together.

stop together.

Take year dust problems to Torit. A standard Torit unit probably holds the answer. If not, a special adaptation to fit your requirements can be quickly fabricated. Just drop us a line—there is no obligation. P.S. Also ask for the latest Torit Catalog.

MANUFACTURING CO. . 307 WALHUT ST. . ST. PAUL 2, MINN.

EXPANSION-CONTRACTION-VIBRATION...

Here are 3 Ways to Cure Them!

These are the right connections—wherever there's unwanted motion—or critical temperature, pressure, vacuum or corrosive action.



TITEFLEX® All-Metal Flexible Hose

stands up to conditions that would ruin rigid tubing. You can use it for scores of ticklish jobs... Connect misaligned or moving parts of machinery. Absorb vibration, or pulsation. Transmit vacuums, shield wires and cables against electrical or electronic interference. Handle difficult gases, vapors or liquids—from ammonia to acid to sea-water to steam. There's more than one application in your plant right now that needs TITEFLEX.



Sectional view shows rugged, flexible, seamed con-



UNIFLEX

Helically-Corrugated Seamless Flexible Tube

is tough, corrosion-resistant, leakproof. Use it in applications too tough for ordinary concentric tubing. For example, oil burners, hydraulic lines, air conditioning equipment, refrigeration machinery, pumps, compressors, diesels and machine tools. Metal-to-metal seat of UNIFLEX fittings assures leakless service. Helical, seamless wall structure gives it greater flexibility and longer life. Thoroughly tested in service, UNIFLEX offers real advantages where conventional tubing gives trouble.



Note the helically-corrugated, seamless wall structure of Uniflex.

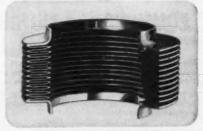


TITEFLEX BELLOWS

have unique, welded, convoluteddiaphragm construction. They absorb lineal movement in many types of equipment—without weakening lines and without reducing the flow rates of gases

or liquids being conveyed. Use TITEFLEX Bellows to accommodate lineal contraction and expansion or high frequency vibration, to seal high pressure

valves and shafts, or to handle gases and corrosive liquids at high temperatures. For special applications, special designs can be furnished. Complete bellows assemblies can be supplied with any required types of fittings.



Cross-section shows the welded, convoluteddiaphragm construction of Titeflex Bellows.

FOR FREE LITERATURE check the products (below) that interest you and mail the coupon. By return mail we'll send you current TITEFLEX literature, containing full descriptions, technical data and suggestions for use. Also, if you have a specific problem, our Engineering Staff will be glad to discuss it with you without obligation.



Let Our	Family of	Products	Help Your	S Titeflex
SEAMED AND	PRECISION BELLINGS	IGHITTON MARNESS	NENOTION SHIELDING	TITEFLEX, INC. 503 Frelinghuysen Ave, Newark 5, N. J. Please send me without cost information about the products checked at the left.
SEAMLESS METAL HOSE BLECTRICAL CONNECTORS	RIGID AND FLEXIBLE WAVE GUIDES	EM SE PL	FIUSES	NAME TITLE FIRM ADDRESS CITY ZONE STATE

GEAR CUTTING MACH:NES, **Bevel Gears, Spiral**

Gleason Works, 1000 University Ave., Rochester 3. N. Y.

GEAR CUTTING MACHINES, Spur and **Bevel Gears (Rotary Cutter)**

Waitham Machine Works, Newton St., Wal-tham, Mass.

GEAR CUTTING MACHINES, Spur and Helical Gears (Hobbing)

Borber-Colman Co., Rock and Mantague, Rock-ford, III.
Hamilton Tool Co., 834 South 9th St., Hamil-ton, Ohio.
Hirschmann, Carl, Co., 30 Park Ave., Man-hosset, N. Y.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.

New Jersey Gear & Mfg. Co., 1470 Chestnut Ave., Hillside, N. J. Triplex Machine Tool Corp., 125 Barclay St., New York, N. Y.

GEAR CUTTING MACHINES, Spur and Helical Goars (Staper or Planer Type)

Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Fellows Gear Shaper Co., 78 River St., Spring-field, Vt.
Kelvin Systems Corp., 135 Front St., New York 5, N. Y.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
National Tool Co., 11200 Madison Ave., Cleve-land, Ohie.

GEAR CUTTING MACHINES, Worm and Worm Wheals

Bork Ciman Co., Rock and Montague, Rock-ford, III.

Fellows Gear Shaper Co., 78 River St., Spring-field, Vt. (Straight and Hourglass Types). Hirschmann, Carl, Co., 30 Park Ave., Man-hasset, N. Y. Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich. New Jersey Gear & Mfg. Co., 1470 Chestnut Ave., Hiliside, N. J.

GEAR FIN'SHING MACHINES

Fellows Gear Shaper Co., 78 River St., Spring-field, Vt. National Broach: & Mch. Co., 5600 St. Jean Ave. Detroit 2, Mich. Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.

GEAR GR'NDING MACHINES

Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Gleason Works, 1000 University Ave., Rochester
3, N. Y.
National Broach & Mch. Co., 5600 St. Jean
Ave., Detroit 2, Mich.
National Tool Co., 11200 Madison Ave.,
Cleveland, Ohio.
Pratt & Whitney, West Hartford 1, Conn.
Vinco Corp., 8855 Schaefer Highway, Detroit
27, Mich.

GEAR HARDEN'NG MACHINES

Gleason Works, 1000 University Ave., Rochester 3, N. Y.

GEAR LAPPING MACH'NES

Fellow Gar Shaper Co., 78 River St., Spring-field, Vt. Gleason Works, 1000 University Ave., Rochester 3, N. Y. Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich. National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.

GEAR MOTORS

See Speed Reducers.

GEAR SHAVING MACHINES

Fellows Gear Shaper Co., 78 River St., Spring-field, Vt. Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich. National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.

GEAR TESTING MACHINERY

Boldwin-Lima-Hamilton Corp., Philadelphia 42. Pa.
Brown & Sharpe Mfg. Co., Providence, R. I.
Eastman Kodak Co., Rocherter, N. Y.
Farrel-Birmingham Co., Inc., 25 Main St., Farrel-Birmingham Co., Inc., 25 Main St., Anson'a, Conn.
Feilows Gear Shaper Co., 78 River St., Springfield, Vt.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12 Mich.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2. Mich.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
Scherr, George. Co., Inc., 200 Lafayette St., New York 12, N. Y.

GEARS, Cut

GEARS, Cut

American Stock Gear Div., Perfection Gear
Co., Harvey, III.

Atlantic Gear Works, Inc., 200 Lafayette St.,
New York 12, N. Y.

New York 12, N. Y.

Automotive Gear Works, Inc., Richmond, Ind.
Baush Machine Tool Co., 156 Wason Ave.,
Springfield 7, Mass.
Bilaram Grar A Mch.
Boston Gear Works, 3200 Moin St., North
Quincy, Mass.
Brad Foote Gear Works, 3200 Moin St., North
Quincy, Mass.
Brad Foote Gear Works, 1309 S. Cicero Ave.,
Cicero 50, Iil.
Broun Gear Co., 239 Richmond, Brooklyn 8,
N. Y.

Cincinnati Gear Co., Wooster Pike and Mariemont Ave., Cincinnati, Ohio.
Cleveland Worm & Gear Co., 3249 E. 80th St.,
Cleveland, Ohio.
Cone-Drive Gears Div., Michigan Tool Co.,
7200 E. McNichols Rd., Detroit, Mich.
Diefendorf Grar Corp., 920 N. Beldon Ave.,
Syracuse, N. Y.

(Continued on page 330)

(Continued on page 330)



America's Most Complete Line of

ABRASIVE BELT, WHEEL, and CARBIDE TOOL GRINDERS

POLISHING and BUFFING MACHINERY

The experience gained in 70 years of designing and building quality machinery is largely responsible for the position Hammond Grinding and Polishing Machinery has today.

In plant after plant where efficiency and reliability of performance is a measuring stick—Hammond Machinery is standard equipment.









WD-10 Wet or Dri Carbide Tool Grinder with double cup wheels. (Also available with a straight and a sup whool).

amont Machinery Builders

1419 DOUGLAS AVENUE

KALAMAZOO, MICHIGAN

Assembly Problem?

Use Black & Decker Screw Drivers for faster work, tighter assemblies, fewer rejects, less operator strain!



"Trade Mark Reg. U. S. Pat. Off.

Earle Gear & Mch. Co., 4707 Stenton Ave., Wayne Junction, Philadelphia 44, Pa. Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn. Gear Specialties, Inc., 2635 W. Medill Ave., Chicago 47, Ill. Gleason Works, 1000 University Ave., Rochester 3, N. Y. Greaves Mch. Tool Co., 2009 Eastern Ave., Cincinnati, Ohio. Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn. Illinois Gear & Mch. Co., 2120 No. Natchez Ave., Chicago 35, Ill. Mass. Gear & Tool Co., 36 Nassau St., Woburn, Mass. Michigan Tool Co., 7171 E. McNichols Rd., Defroit 12, Mich. New Jersey Gear & Mfg. Co., 1470 Chestnut Ave., Hillside, N. J. Ohio Gear Co., 1333 E. 179th St., Cleveland, Ohio. Parkins Mch. & Gear Co., Rox 1611, Spring-

Perkins Mch. & Gear Co., Box 1611, Spring-field 2, Mass.

Philadelphia Gear Works, Erie Ave. and G St., Philadelphia, Pa.

Stahl Gear & Mch. Co., 3901 Hamilton Ave., Cleveland 14, Ohio. Williamson Gear & Machine Co., 2606 Martha St., Philadelphia 25, Pa.

GEARS, Rawhide and Non-Metallic

American Stock Gear Div., Perfection Gear Co., Harvey, III.
Atlantic Gear Works, Inc., 200 Lafayette St., New York 12, N. Y.
Boston Gear Works, 3200 Main St., North Quincy, Mass.
Braun Gear Co., 239 Richmond, Brooklyn 8, N. Y.
Cincinnati Gear Co., Wooster Pike and Mariemont Ave., Cincinnati, Ohio.
Diefendorf Gear Corp., 920 N. Beldon Ave., Syracuse, N. Y.
Earle Gear & Mch. Co., 4707 Stenton Ave., Wayne Junction, Philadelphia 44, Pa.
Gear Specialties, Inc., 2635 W. Medill Ave., Chicago 47, III.
Greaves Mch. Tool Co., 2009 Eastern Ave., Cincinnati, Ohio.

rocunier

Safety Chuck Company

16 S. CLINTON ST. CHICAGO 6, ILL.

Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn. Ohio Gear Co., 1333 E. 179th St., Cleveland, Ohio. Philadelphia Gear Works, Erie Ave. and G St., Philadelphia P. Philadelphia, Pa. Co., 3901 Hamilton Ave., Cleveland 14, Ohio. Williamson Gear & Machine Co., 2606 Martha St., Philadelphia 25, Pa.

GENERATORS, Electric

General Electric Co., Schenectady 5, N. Y. Lincoin Electric Co. (Arc), 22801 St. Clair Ave., Cleveland, Ohio. Reliance Elec. & Engrg. Co., Collinwood Sta., 1088 Ivanhoe Rd., Cleveland, Ohio.

GOGGLES

American Optical Co., Southbridge, Mass.

GRADUATING MACHINES

Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I. Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis. Greaves Mch. Tool Co., 2009 Eastern Ave., Cincinnati, Ohio.

Cities Service Oil Co., 70 Pine St., New York, N. Y. N. Y.

Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.

Lubriplate Div., Fiske Bros. Refining Co., 129

Lockwood St., Newark S, N. J.,

Pure Oil Co., 35 E. Wacker Drive, Chicago, III.

Shell Oil Co., 50 West 50th St., New York, N. Y.

Sinclair Refining Co., 630 5th Ave., New York, N. Y.

Standard Oil Co. (Indiana), 910 S. Michigen, Chicago, III.

Sun Oil Co., 1608 Walnut St., Philadelphia, Pa. Sun Oil Co., 1608 Walnut St., Pa. Pa. Texas Co., 135 E. 42nd St., New York, N. Y. Tide Water Associated Oil Co., 17 Battery Place, New York, N. Y.

GRINDERS, Carbide Tool

Cosa Corp., 405 Lexington Ave., New York 17, N. Y. N. Y.
Delta Power Tool Div., Rockwell Mfg. Co.,
614G N. Lexington Ave., Pittsburgh 8, Pa.
DoAll Co., 254 Laurel Ave., Des Plaines, III.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit
32, Mich.
Hammond Machinery Builders, Inc., 1600 32, Mich.
Hammond Machinery Builders, Inc., 1600
Douglas Ave., Kalamazoo 54, Mich.
Oliver Instrument Co., 1410 E. Maumee St.,
Adrian, Mich.
Orban, Kurt, Co., Inc., 205 East 42nd St.,
New York 17, N. Y.
Standard Electrical Tool Co., 2488-90 River Rd.,
Cincinnati 4, Ohio.

GRINDERS, Die and Mold

Consolidated Mch. Tool Corp., Rochester, N. Y. Dumore Co., 1300 17th St., Racine, Wis. Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich. Pratt & Whitney, West Hartford 1, Conn. Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.

GRINDERS, Oilstone, for Woodworking

Mummert-Dixon Co., Hanover, Pa.

GRINDERS, Pneumatic

Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y. Ingersoll-Rand Co., Phillipsburg, N. J. Madison-Kipp Corp., Madison, Wis. Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, III.

GRINDERS, Portable Electric and Toolpost

Black & Decker Mfg. Co., E. Penna. Ave., Towson, Md.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Dumore Co., 1300 17th St., Racine, Wis. Hammond Machinery Builders, Inc., 1600-Douglas Ave., Kalamazoo 54, Mich. Millers Falls Co., Greenfield, Mass.
Skil Corp., 5039 Elston Ave., Chicago, III. Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio. (Continued on page 332)





...Zone.....State..

Please send me full details on the new Procunier "TAP KING" Heavy Duty Tapping Attachment.

City.....





MACHINE AND TOOL CO.

Since 1920, Designers and Builders of Special Tools, Dies, Jigs, Fixtures and Special Machines

SERVICE

ANNOUNCING



OIL HARDENING TOOL STEEL

WL introduces "Whelco"-a new tool steel of M grade - a new steel of maximum toughness, hardness and strength - a steel to assure maximum results at low cost! "Whelco" offers great penetration of hardness, great toughness at high hardness, wide hardening range, fine grain structure, and desirable non-deforming characteristics. "Whelco" has good forging properties and is readily machinable in the annealed condition. All WL warehouses stock "Whelco" M tool steel in a wide variety of flats and squares. Call your nearest WL man for a trial order - the results will speak for themselves!

WL steels are metallurgically constant. This guarantees uniformity of chemistry, grain size, hardenability - thus eliminating costly changes in heat treating specifications.

Write today for your FREE COPY of the Wheelock, Lovejoy Data Book, indicating your title and company identification. It contains complete technical information on grades, applications, physical properties, tests, heat treating, etc.

Warehouse Service *

NEWBOULD, LTD., MONTREAL

138 Sidney St., Cambridge 39, Mass.

and Cleveland . Chicago . Detroit Billside, N. j. . Buffalo . Cincinnati

GR NDING FIXTURES

Geometric Tool Co. (Die Chaser), Westville Station, New Haven 15, Conn. Modison Mfg. Co., Muskegon Heights, Mich.

GRINDING MACHINES, Abrosive Belt

Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa. Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich. Hill Acme Co., 1201 W. 65th St., Cleveland 2,

Ohio.

Ohio.

Ohio.

Mattison Mch. Works, Rockford, Ill.

Mead Specialties Co., 4114 North Knox Ave.,
Chicago 41, Ill.

Porter-Cabie Mch. Co., Salina St., Syrocuse,
New York.

Standard Electrical Tool Co., 2488-90 River Rd.,
Cincinnati 4, Ohio.

Walker-Turner Div., Kearney & Trecker Corp.,
South Ave., Plainfield, N. J.

Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

GRINDING MACHINES, Bench

FOR

0 M

MA

RE

REM

EN

GRIND:NG MACHINES, Beach
Aflas Press Co., 1253 N. Pitcher Ave., Kalomazoo, Mich.
Black & Drcker Mfg. Co., E. Penna. Ave.,
Towson, Md.
Delta Power Tool Div., Rockwell Mfg. Co.,
614G N. Lexington Ave., Pittsburgh 8, Pa.,
Gorton, Geo., Mch. Co., 1110 W. 13th St.,
Racine, Wis.
Hammond Machinery Builders, Inc., 1600
Doualas Ave., Kalamazoo 54, Mich.
Hardinze Bross., Inc., 1418 College Ave.,
Elmira, N. Y.
Millers Falls Co., Greenfield, Mass.
Rivett Lathe & Grinder, Inc., Brighton, Boston
35, Mass.
Ryerson Jos. T., & Son, Inc., 2558 W. 16th
St., Chicago 18, Ill.
Standard Electrical Tool Co., 2488-90 River Rd.,
Cincinnati 4, Ohlo.
Walker-Turner Div., Kearney & Trecker Corp.,
South Ave., Plainfield, N. J.

GRINDING MACHINES, Broach

Colonial Broach Co., Detroit 13, Mich. Lapointe Mch. Tool Co., 34 Tower St., Hud-son, Mass.

GR'NDING MACHINES, Comshaft

Landis Tool Co., Waynesboro, Pa. Norton Co., 1 New Bond St., Worcester 6, Mass.

GR'NDING MACHINES, Carbide Tool

Arter Grinding Mch. Co., 15 Sagamore Rd., Worcester 5, Mass. Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich., Delta Power Tool Div., Rockwell Mfg. Co., 6146 N. Lexington Ave., Pittsburgh 8, Pa. Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich. Ex-Cell-O Carp., 1200 Oakman Biva., Detroit 32, Mich. Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y. Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich. Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y. Sheffield Corp., 721 Springfield, Dayton, Ohlo. Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohlo. Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

GRINDING MACHINES, Centerless

Cincinnati Grinders, Inc., Cincinnati, Ohio.
Diversified Metal Products Co., 5125 Alcoa
Ave., Los Angeles 58, Calif.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Landis Tool Co., Inc., Waynesboro, Pa.
Triplex Machine Tool Corp., 125 Barclay St.,
New York, N. Y.

GRINDING MACHINES, Chucking

Bryant Chucking Grinder Co., 257 Clinton St., Springfield, Vt. Landis Tool Co., Inc., Waynesboro, Pa.

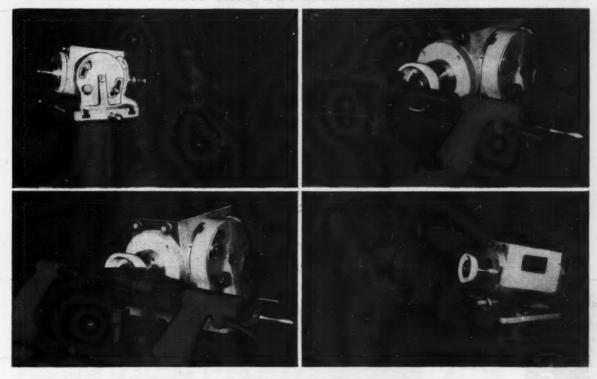
GRINDING MACHINES, Cronkshaft

Landis Tool Co., Waynesboro, Pa. Norton Co., 1 New Bond St., Worcester 6,

GRINDING MACHINES, Cylindrical

Arter Grinding Mch. Co., 15 Sagamore Rd., Worcester 5, Mass. (Continued on page 334)

LOOK AT THE NEW AND BETTER WAY TO GRIND TOOLS



THE NEW POPE SUPER PRECISION 1 HP, 3600 RPM MOTORIZED TOOL AND CUTTER GRINDER HEAD

With Angular Adjustment In A Vertical Plane

Specify this new and better motorized Spindle on your next tool and cutter grinder.

Replace less effective, less versatile heads on your present grinders.

This totally enclosed POPE Spindle with sealed-in lubrication has the radial and axial rigidity to make wheels cut faster - spark out quicker.

It produces the kind of cutting edge on your tools that stands up and cuts longer.

It is easy to install.

It reduces set-up time.

It reduces grinding time.

Ask us for a quotation

No. 89

POPE

OPE MACHINERY CORPORATION
ESTABLISHED 1920

261 RIVER STREET . HAVERHILL MASSACHUSETTS BUILDERS OF PRECISION SPINDLES

MACHINERY, November, 1952-333

Brown & Sharpe Mfg. Co., Providence, R. I. Cincinnati Grinders, Inc., Cincinnati, Ohio. Cosa Corp., 405 Lexington Ave., New York 17, N. Y. N. Y.
DoAll Co., 254 Laurel Ave., Des Plaines, III,
Dumore Co., 1300 17th St., Racine, Wis.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y. Kelvin Systems Corp., 135 Front St., New York 5, N. Y. S, N. Y. Landis Tool Co., Inc., Waynesboro, Pa. Norton Co., 1 New Bond St., Worcester 6, Rivett Lathe & Grinder, Inc., Brighton, Boston Rivett Larne & Grinder, Man, Stages, 35, Mass.
Shaffield Corp., 721 Springfield, Dayton, Ohio.
Triplex Machine Tool Corp., 125 Barclay St.,
New York, N. Y.

GRINDING MACHINES, Die Cheser

Eastern Mch. Screw Corp., New Haven, Conn. Landis Machine Co., Waynesboro, Pa.

GRINDING MACHINES, Disc

Besly-Welles Corp., Beloit, Wis.
Gardner Machine Co., 414 E. Gardner St.,
Beloit, Wis.
Hammond Machinery Builders, Inc., 1600
Douglas Ave., Kalamazoo 54, Mich.
Mathison Machine Works, Rockford, Ill.
Porter-Cable Machine Co., Salina St., Syracuse,
N. Y. N. Y. Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.

GRINDING MACHINES, Drill

Biake, Edward, Co., 442 Cherry St., West Newton 65, Mass.
Delta Power Tool Div., Rockwell Mfg. Co., 6146 N. Lexington Ave., Pittsburgh 8, Pa. Gallmeyer & Livingston Co., 336 Straight Ave., S. W. Grand Rapids 4, Mich.
Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.

Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y. Union Twist Drill Co., Athol, Mass.

GRINDING MACHINES, Face

Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.
Cosa Corp., 405 Lexington Ave., New York 17,
N. Y. N. Y.
Mattison Machine Works, Rockford, III.
Oliver Instrument Co., 1410 E. Maumee St.,
Adrian, Mich.
Orban, Kurt, Co., Inc., 205 East 42nd St.,
New York 17, N. Y.

GRINDING MACHINES, Flexible Shaft

See Flexible Shaft Equipment.

GRINDING MACHINES, Gop

Cincinnati Grinders, Inc., Cincinnati, Ohio. Landis Tool Co., Waynesboro, Pa.

GRINDING MACHINES, Goor Tooth

See Gear Grinding Machines.

ford. III.

GRINDING MACHINES, For Sharpening Cutters, Reamers, Hobs, Etc. Barber-Colman Co., Rock and Montague, Rock-

ford, III.
Blake, Edward, Co., 442 Cherry St., West Newton 65, Mass.
British Industries Corp., 164 Duane St., New York, N. Y.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Mch. Co., Cincinnati, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y. P. Petra, Power, Tol. Div. Bockwell, Mfg. Co. Cosa Corp., 405 Lexington Ave., New York 17, N. Y. Y. Pelta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Patellows Gear Shaper Co., 78 River St., Springfield, Vt. Gallmeyer & Livingston Co., 336 Straight Ave., S. W. Grand Rapids 4, Mich. Gorton, George, Mch. Co., 1110 W. 13th St., Racine, Wis. Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill. Landis Tool Co., Waynesboro, Pa. LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio. Norton Co., 1 New Bond St., Worcester 6, Mass.

Diver Instrument Co., 1410 E. Maumee St., Adrian, Mich.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.
Pratt & Whitney, West Hartford 1, Conn. Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Thompson Grinder Co., 1500 W. Main St., Springfield, Ohio.
Union Twist Drill Co., Athol, Mass.

GRINDING MACHINES, For Sharpening **Turning and Planing Tools**

Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa. Ex-Cell-O Corp., 1200 Oakman Bivd., Detroit 32, Mich., Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich. Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich. Orbon, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y. Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio. Walker, O. S., Co., Inc., Worcester, Mass. Waltham Machine Works, Newton St., Waltham, Mass.

GRINDING MACHINES, Internal

Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.
Arter Grinding Mch. Co., 15 Sagamore Rd., Worcester S, Mass.
Bryant Chucking Grinder Co., 257 Clinton St., Springfield, Vt.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y. Dumore Co., 1300 17th St., Racine, Wis. Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Nelse, Karl A., Dept. M, 381 Fourth Ave., New York 16, N. Y.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.

(Continued on page 336)



Using other than a Madison Boring Tool for suitable Madison tool applications is like putting a square peg in a round hole. That's because every Madison-engineered tool is built to do your particular boring job faster at lower cost . . . no matter whether you use a standard Madison cutter in a standard Madison bar, or specially designed Madison bars and Madison cutters . . . engineeded by the "Men With Holes in Their Heads." To get the benefit of thirty-five years specialized experience in boring operations exclusively . . . thirty-five years of concentration on lowering boring costs and increasing production, write Madison today. There's no obligation.

BETTER BORING TOOLS ... MORE BORING EXPERIENCE

Write for this informative Madison Borereaming Catalog. It's yours for the asking.



MANUFACTURING COMPANY MUSKEGON, MICHIGAN





Redesigned just in time to meet the needs of increased production in your

plant, this ACME Model XWT eight spindle nut tapper will not only step up production but because of semi-automatic operation, will greatly reduce operator fatigue. Built in 6 and 8 spindle models in 1" and 2" capacities. The same machine can also be adapted for tapping couplings. Delivery schedules are reasonable.

FEATURES

- 1 Conveniently located push buttons operate the spindles.
- 2 Hydraulically controlled spindle cycle.
- 3 Repeat cycle is automatic.
- 4 Adjustments for change of cycle are quick and easy.
- 5 Change gears running in oil bath easily replaced for different spindle speeds.
- 6 Silent operation.
- 7 Worm drive in spindles.
- 8 Anti-friction bearings.

THE HILL ACME COMPANY

ACME MACHINERY DIVISION . 1203 W. 65th St., Cleveland 2, Ohio

"ACME" FORCING - THREADING - TAPPING MACHINES - ALSO MARUFACTURERS OF "HILL" GRINDING AND POLISHING MACHINES

Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Wicaco Machine Corp., Stenton Ave. and Louden St., Philadelphia, Pa.

GRINDING MACHINES, Jig

Hirschmann, Carl, Co., 30 Park Ave., Man-hasset, N. Y. Moore Special Tool Co., Inc., 724 Union Ave., Bridgeport, Conn. Pratt & Whitney, West Hartford 1, Conn.

GRINDING MACHINES, Knife and Shear

Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.
Hanchett Mfg. Co., Big Rapids, Mich.
Hill Acme Co., 1201 W. 65th St., Cleveland 2,
Ohio.
Matthiag Machine Wark Backford !!!

Mattison Machine Works, Rockford, III. Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.

GRINDING MACHINES, Piston Ring

Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.
Mattison Machine Works, Rockford, Ill.

GRINDING MACHINES, Profile

Cleveland Grinding Machine Co., 1643 Eddy Rd., Cleveland 12, Ohio, Cosa Corp., 405 Lexington Ave., New York 17, N. Y. Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y. Sheffield Corp., 721 Springfield, Dayton, Ohio.

GRINDING MACHINES, Radial, Ball Race, Etc.

Landis Tool Co., Waynesboro, Pa.

GRINDING MACHINES, Rodius, Link

Consolidated Mch. Tool Corp., Rochester, N. Y. Sundstrand Mch. Tool Co., 2531 11th St., Rockford. III.

GRINDING MACHINES, Ring Wheel

Besly-Welles Corp., Beloit, Wis. Gardner Machine Co., 414 E. Gardner St., Beloit, Mattison Machine Works, Rockford, III. Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.

GRINDING MACHINES, Roll

Farrel-Birmingham Co., 25 Main St., Ansonia, Conn. Landis Tool Co., Waynesboro, Pa. Norton Co., I New Bond St., Worcester 6,

GRINDING MACHINES, Spline Shaft

Kelvin Systems Corp., 135 Front St., New York 5, N. Y.

GRINDING MACHINES, Surface

GRINDING MACHINES, Surface

Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.

Arter Grinding Mch. Co., 15 Sagamore Rd.,
Worcester 5, Mass.

Blanchard Machine Co., 64 State St., Cambridge, Mass.

British Industries Corp., International Machinery
Div., 164 Duane St., New York, N. Y.
Brown & Sharpe Mfg. Co., Providence, R. I.
Delta Power Tool Div., Rockwell Mfg. Co.,
614G N. Lexington Ave., Pittsburgh 8, Pa.
DoAll Co., 254 Lourel Ave., Des Plaines, Ill.
Gallmeyer & Livingston Co., 336 Straight Ave.,
S.W., Grand Rapids 4, Mich.
Gardner Machine Co., 414 E. Gardner St.,
Beloit, Wis.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Hill Acme Co., 1201 W. 65th St., Cleveland 2,
Ohio. Mattison Machine Works, Rockford, III. Norton Co., 1 New Bond St., Worcester 6, Norton Co., I New Bond St., Worcester o, Mass.

Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.

Pratt & Whitney, West Hartford 1, Conn.
Reid Bros. Co., Inc., Beverly, Mass.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Standard Electrical Tool Co., 2488-90 River Rd.,
Cincinnati 4, Ohio.

Taft-Peirce Mrg. Co., Woorsocket, R. I.
Thompson Grinder Co., 1500 W. Main St.,
Springfield, Ohio
Walker, O. S., Co., Inc., Worcester, Mass.

GRINDING MACHINES, Top

Blake, Edward, Co., 442 Cherry St., West Newton 65, Mass. Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.

Jones & Lamson Mch. Co., 160 Clinton St.,
Springfield, Vt.

GRINDING MACHINES, Thread

Dumore Co., 1300 17th St., Racine, Wis. Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich. Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y. Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt. Landis Machine Co. (Centerless), Waynesboro, Pa. Springriety, v. Co. (Centerless), Waynesboro, Pa. Landis Machine Co. (Centerless), Waynesboro, Pa. Crban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y. Sheffield Corp., 721 Springfield, Dayton, Ohio.

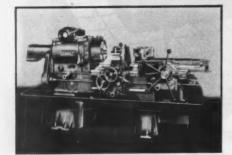
GRINDING MACHINES, Universal

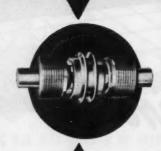
Brown & Sharpe Mfg. Co., Providence, R. I. Cincinnati Grinders, Inc., Cincinnati, Ohio. Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y. Kelvin Systems Carp., 135 Front St., New York 5, N. Y. Landis Tool Co., Waynesboro, Pa. Norton Co., 1 New Bond St., Worcester 6, Mass. Mass. Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.

GRINDING MACHINES, Worm

Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt. Pratt & Whitney, West Hartford 1, Conn. (Continued on page 338)

Reduces Operating Time





B-W ENGINEERING

MAKES IT

WORK

B-W

PRODUCTION MAKES IT

ENGINEERING BULLETIN SENT ON

And Effort to Minimum

The GISHOLT Ram Type TURRET LATHE is the result of many years of collective experience in solving high speed machining problems for the metal working industry. For over twenty years ROCKFORD CLUTCHES have been used in these efficient lathes. Let ROCKFORD clutch engineers advise concerning the best power transmission control for your machines.

ROCKFORD CLUTCH DIVISION AND



your "Hole" Future

IS ASSURED WITH NATCO EQUIPMENT

ENGINEERED FOR QUALITY AND QUANTITY PRODUCTION

MEDIUM SIZED VERTICAL

DRILLER AND TAPPER

A-33 LIGHT SENSITIVE MULTI-DRILLER OR TAPPERS



HOLESTEEL 2-WAY FLOOR TYPE FOR DRILLING AND TAPPING

HIGH-SPEED MULTI-DRILLER OR TAPPERS

3-WAY HOLETAPPER WITH INDIVIDUAL LEAD SCREWS



TURNING AND FACING

2-WAY BOREFACE FOR BORING,

ADJUSTABLE SPINDLE
MULTI-DRILLER AND TAPPER

HOLEWAY AUTOMATIC

2-WAY HOLEUNIT FOR DRILLING, BORING, REAMING AND TAPPIN



STATION TYPE



PROCESSING MACHINES



Here are a few representative machines from the complete NATCO line ... including a wide range from small, fast, light sensitive multidrillers and tappers to large automatic processing machines . . . from single spindle to an unlimited number of spindles . . . from 1/16 inch drill to 14 inch or larger bore. Materials worked include iron, steel, bronze, aluminum, plastic and wood. Call a NATCO Field Engineer.

Call a Natco Field Engineer

To help you solve your problems in Drilling, Tapping, Boring & Facing.



NATIONAL AUTOMATIC TOOL COMPANY, INC., Richmond, Indiana



Branch Offices

1809 Engineering Bldg., Сизслоо . 409 New Center Bldg., Deтлогт 1807 Elmwood Ave., BUTTALO . 2902 Commerce Bldg., New York City

GRINDING WHEELS

Bakelite Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y. Bay State Abrasive Products Co., Westboro,

Bakelite Co., Div. Union Carbide & Corbon Corp., 30 E. 42nd St., New York 17, N. Y. Bay State Abrasive Products Co., Westboro, Mass.
Besly-Welles Corp., Beloit, Wis.
Blancherd Machine Co., 64 State St., Cambridge, Mass.
Carborundum Co., Buffalo Ave., Niogara Falls, N. Y.
Cincinnati Milling Machine Co., Grinding Wheels Div., Cincinnati, Ohio.
Gardner Machine Co. (Surface Grinder), 414 E. Gardner St., Beloit Wis.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Norton Co., 1 New Band St., Worcester 6, Mass.
Precision Diamond Tool Co., 102 South Grove Ave., Egign, Ill. (Diamond),
Simonds Abrasive Co., Tacony and Fraley Sts.,
Bridesburg, Philadelphia, Pa.

GROOVING TOOLS, Internal

Waldes Kohinoor, Inc., 4716 Austel Place, Long Island City 1, N. Y.

HAMMERS, Drop

Bliss, E. W., Co., 1375 Raff Rd., S. W., Canton, Ohio. Chambersburg Engrg. Co., Chambersburg, Pa. Columbia Machinery & Engineering Corp., Hamilton 1, Ohio. Morgan Engrg. Co., Alliance, Ohio.

HAMMERS, Forging Air

Chambersburg Engrg. Co., Chambersburg, Pa.

HAMMERS, Pneumatic

Chambersburg Engrg, Co., Chambersburg, Po. Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y. Ingersoll-Rand Co., Phillipsburg, N. J.

HAMMERS, Portable Electric

Black & Decker Mfg. Co., E. Penna Ave., Towson, Md. Millers Falls Co., Greenfield, Mass.

HAMMERS, Power

Chambersburg Engrg. Co., Chambersburg, Pa. Lobdell United Co., 2000 "G" St., Wilmington 99, Del.

HAMMERS, Shaft

S K F Industries, Inc., P. O. Box 6731, North Philadelphia, Pa. Standard Pressed Steel Co., Jenkintown, Pa.

HAMMERS, Soft

Chambersburg Engrg. Co., Chambersburg, Po. Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

HAMMERS, Steam

Chambersburg Engrg. Co., Chambersburg, Pa.

HARDENING EQUIPMENT

Lepel High Frequency Laboratories, Inc. (Induction), 55th St. and 37th Ave., Woodside 77, N. Y.
Ohio Crankshaft Co., 3800 Harvard Ave., Cleveland, Ohio.

HARDENING MACHINES, Flome

Cincinnati Milling Machine Co., Cincinnati, Ohio.

HARDNESS TESTING INSTRUMENTS

Ames Precision Mch. Wks., Waltham, Mass. Shore Instrument & Mfg. Co., Van Wyck Ave. and Carll St., Jamaica, N. Y. Wilson Mechanical Instrument Co., Inc., 230-D Park Ave., New York, N. Y.

HEADING MACHINES

National Machinery Co., Greenfield and Stanton Sts., Tiffin, Ohio.

HEAT-TREATING EQUIPMENT

Ipsen Industries, Inc., 536 No. Madison, Rockford, III.

HEAT-TREATMENT OF METALS

Bennett Metal Treating Co., Elmwood, Conn.

HOBBING MACHINES

See Gear Cutting Machines, Spur and Helical Gears (Hobbing), and Gear Cutting Machines, Worm and Worm Wheels.

Barber-Colman Co., Rock and Montague, Rock-ford, III. Brown & Sharpe Mfg. Co., Providence, R. I. Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich. National Twist Drill & Tool Co., Rochester, Mich. Mich. New Jersey Gear & Mfg. Co., 1470 Chestnut Ave., Hillside, N. J. Union Twist Drill Co., Athol, Mass.

HOIST HOOKS

Bethlehem Steel Co., Bethlehem, Pa. Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

HOISTING AND CONVEYING EQUIPMENT

Cleveland Crane & Engrg. Co., Wickliffe, Ohio. Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

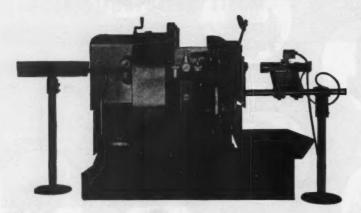
HOISTS, Air

Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y. Hanna Engineering Works, 1752 Elston Ave., Chicago, III. Ingersoll-Rand Co., Phillipsburg, N. J.

HOISTS, Chain, Etc.

Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, III. (Continued on page 340)

The NEW MODERN AUTOMATIC CUTTING-OFF MACHINE



Cuts Off Tubing, Pipe and Shafting . . . FAST

Cuts off longer pieces than a regular automatic machine. In fact, cuts off any length you want-and cuts it faster. If your production requires quantity cutting-off of tubing, pipe or shafting, check the figures below against your present time.

1/2" Tubing This machine cuts off and

chamfers both outside edges of ½" .030 wall tubing, 5" long, at the rate of one every 2.5 seconds.

1 1/4" Cold Rolled

This machine cuts off and chamfers both ends of 11/4" cold rolled, 20" long, at the rate of one every 20 seconds.

1º Tubing

This machine cuts off and chamfers both outside edges of 3" long, at the rate of one every 3 seconds.

These popular, time saving machines are now available in four sizes, handling work up to 63/4" O.D. Their many cost cutting features are described and illustrated in our latest catalog that will be mailed promptly an request.

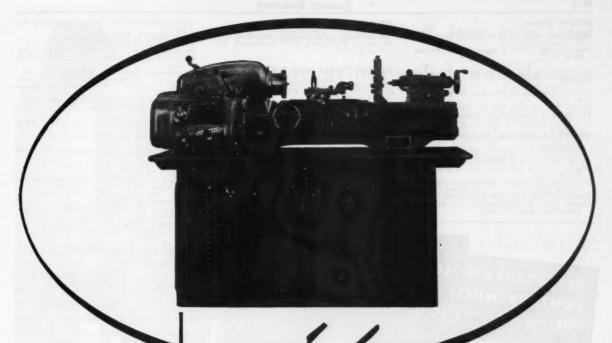
41 Threaded Studs



Cut and chamfered at one time—in 8 seconds—from 10 ft. length of stock already threaded. (34" U. S. Standard.) Clean cut. Clean chamfer. Nuts start easily, with no extra finishing required.

WRITE FOR ILLUSTRATED CATALOG.

MODERN MACHINE TOOL CO.



FEATURES:

- ★ Designed and made throughout for PRECISION.
- ★ Hardened and precision ground bed ways.
- ★ Sixty-six thread cutting and feed changes without gear change.
- ★ ALL spindle speeds are stepless, 25 to 2000 RPM, forward and reverse.
- ★ Choice of M. G. Variable Speed or new Hendey Electronic drive.
- ★ Spindle runs in preloaded, superprecision, anti-friction bearings, both ends.
- * Super-precision lead screw.
- Safety features preventing simultaneous engagements of belt feed with gear feed, and lead screw with rack feed.
- ★ Separate feed rod (independent of lead screw).
- Special clamping device for tailstock.

MODERN ENGELI

9"x24" TOOL AND GAGE-MAKERS' LATHE



FEATURING HARDENED & PRECISION GROUND BED WAYS

The Hendey 9" x 24" Tool and Gage-Makers' Lathe is a high-speed precision lathe — designed to satisfy the universal demand of expert tool and gage makers for a precision lathe of heavier design and greater adaptability. It has a swing over the ways of 104" and over the cross slide of 5%". Maximum capacity of spring collets is 1%". A choice of the M. G. Variable Speed Drive or the new Hendey Electronic Drive is available. This tool and gage-makers' lathe will perform all operations within its scope most accurately and efficiently—it will save time and money, and eliminate spoilage of work chargeable to inaccuracy, insensitivity or incapacity of lathe equipment.

Hendey is especially qualified to manufacture such a lathe, because, for more than 70 years it has made lathes which have proved its claim of "Prestige with Production."

Write for free illustrative catalog on the Hendey 9" x 24" Lathe

the hendey machine company

... another product from the plant of precision! MAIN OFFICE & PLANT: TORRINGTON, CONN. BRANCH OFFICES: New York, Chicago, Boston, Detroit, Rochester, Los Angeles, San Francisco
REPRESENTATIVES: Philadelphia, Cleveland, Pittsburgh

HOISTS, Electric

Philadelphia Gear Works, Inc., Erie Ave. and G St., Philadelphia, Pa. Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

HONES

Carborundum Co., Buffalo Ave., Niagara Falls, N. Y. Moline Tool Co., 102 20th St., Moline, III. Norton Co., 1 New Bond St., Worcester 6, Mass.

HONING MACHINES, Internal

Barnes Drill Co., 814 Chestnut, Rockford, III.
Barnes, W. F. & John, Co., 201 S. Water St.,
Rockford, III.
Micromatic Hone Corp., 8100 Schoolcraft, Detroit 4, Mich.
Moline Tool Co., 102 20th St., Moline, III.
Snyder Tool & Engineering Co., 3400 E.
Lafayette, Detroit 7, Mich.

HONING MACHINES, External

Barnes Drill Co., 814 Chestnut, Rockford, Ill. Micromatic Hone Corp., 8100 Schoolcraft, De-troit 4, Mich.

HONING TOOLS AND FIXTURES

Barnes Drill Co., 814 Chestnut, Rockford, III. Micromatic Hone Corp., 8100 Schoolcraft, De-troit 4, Mich.

HOSE, Leather, Rubber, Metallic, Etc.

American Metal Hose Br. American Brass Co., 25 Broadway, New York, N. Y. Titefiex, Inc., 500 Frelinghuysen Ave., Newark 5, N. J.

HYDRAULIC MACHINERY, **Tools and Equipment**

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.

Baldwin-Lima-Hamilton Corp., Philadelphia 42,

Pa. Barnes, John S., Corp., Rockford, III. Bethlehem Steel Corp., Bethlehem, Pa. Birdsboro Steel Fdry. & Mch. Co., Birdsboro, Pa. Bliss, E. W., Co., 1375 Raff Rd., S. W., Canton, Ohio.

Ohio.
Chambersburg Engrg. Co., Chambersburg, Pa.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Denison Engrg. Co., 1160 Dublin St., Columbus
16, Ohio.
Farquhar, A. B., Co., 21 Duke St., York, Pa.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago,

Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio. Hydropress, Inc., 350 Fifth Ave., New York 1,

N. Y.
Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.
Michigan Tool Co., 7171 E. McNichols Rd.,
Detroit 12, Mich.
Rockford Mch. Tool Co., 2500 Kishwaukee St.,
Rockford Mch. Tool Co., 2500 Kishwaukee St.,
Rockford, III.
Snyder Tool & Engineering Co., 3400 E.
Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St.,
Rockford, III.
Wilson, K. R., 215 Main St., Buffalo, N. Y.

HYDRAULIC POWER UNITS OR TOOL HEADS

Barnes Drill Co., 814 Chestnut, Rockford, III. Barnes, John S., Corp., Rockford, III. Barnes, W. F. & John, Co., 201 S. Water St., Rockford, III. Barnes, W. F. & John, Co., 201 S. Water St., Rockford, III. Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich. Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio. Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.

INDEXING AND SPACING EQUIPMENT

INDEXING AND SPACING EQUIPMENT
Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.
Brown & Sharpe Mfg. Co., Providence, R. I.
Engis Equipment Co., 431 S. Dearborn St.,
Chicago 5, III.
Hartford Special Mchry. Co., 287 Homestead
St., Hartford, Conn.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Kempsmith Machine Co., 1819 S. 71st St.,
Milwaukee 14, Wis.
Rockford, III.
Sundstrand Mch. Tool Co., 2500 Kishwaukee
St., Rockford, III.
Urner Bros., Inc., 2625 Hilton Rd., Ferndale
20, Mich.
Vinco Corp., 8855 Schaefer Highway, Detroit
27, Mich.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland
23, Ohio.

INDICATORS, Dial

Ames, B. C., Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
DoAll Co., 254 Laurel Ave., Des Plaines, III.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Homestrand, Inc., Larchmont, N. Y.
Neise, Karl A., Dept. M, 381 Fourth Ave.,
New York 16, N. Y.
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Starrett, The L. S., Co., Athol, Mass.

INDICATORS, Speed

Bristol Co., Platts Mills, Waterbury, Conn. Brown & Sharpe Mfg. Co., Providence, R. I. Starrett, The L. S., Co., Athol, Mass. Veeder-Root, Inc., 20 Sargent St., Hartford,

INDICATORS, Test

Ames, B. C., Co., Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Neise, Karl A., Dept. M, 381 Fourth Ave.,
New York 16, N. Y.
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Starrett, The L. S., Co., Athol, Mass.

INDUCTION HEATING EQUIPMENT

General Electric Co., Schenectady, N. Y. Lepel High Frequency Laboratories, Inc., 55th St. and 37th Ave., Woodside 77, N. Y. Ohio Crankshaft Co., 3800 Harvard Ave., Cleveland, Ohio.

(Continued on page 344)



The MAGNI-FORM Universal Contour Wheel Dresser is designed to fit any type horizontal surface grinder. It can be mounted on the magnetic chuck or directly on the machine table. Check these advantages and compare!

- 1. "Tenths" occuracy at once.
- 2. Simple operation gives high precision at low cost. 3. Lighter, more compact, better belanced. No interfering overhang.
- Dresses any complex contour that can be en-tered by the diamond ecross the full width of the wheel.

Uses a 10:1 ratio template to control movement of the diamond. Simple ratio arm and slide is without com-plicated linkages. The MAGNI-FORM Universal

Dresser is easy to set up, simple to operate. Write for complete details in Bulletin M.



HOGLUND

ENGINEERING AND MANUFACTURING CO INC BERKELEY HEIGHTS N J

2. Automatic Contour Wheel Dresser—for precision dressing of wheels for the production form grinding of Gear and Spline Profiles, Thread Forms, Gas Turbine Bucket Root Forms, etc.

3. Universal Contour Wheel Dresser for Cylindrical Grinders—for 1" and 2" wide wheels.

Special Dressers for Aircraft Gear Grinding — producing a perfect blend between involute form and root fillet — AUTO-MATICALLY.



SOME OF THE HUNDREDS OF DIFFERENT OPERATIONS YOU CAN DO WITH THIS UNIT AND ITS ACCESSORIES . . .

Clean Out Slots Smooth Up Crowns Clean Out Corners Remove Saw Burrs **Remove Parting Lines Remove Tapping Burrs Chamfer Corners** Remove Machine Tool Marks

Remove Flash in Corners Remove Drilling Burrs Remove Flash Between Round Off Corners Grind Off Excess Stock Round Off Slots Remove Pits Clean Up Pieces

Remove Nibs **Grind Edges to Smooth** Curves Remove Milling Burrs Remove Deep Scratches Remove Grinding Lines **Break Corners** Remove Surface

Imperfections

The DELTA Belt Grinding Machine

- Contact wheel gives longer belt life—elim-inates bother of "set-up wheels" and dressing of "grinding wheels."
- 2. Inexpensive, long-wearing abrasive belts remove metal faster, are easily replaceable, save time, labor, and materials.

With this efficient belt grinding, polishing and de-burring machine you can handle a multitude of metal-removal operations that originally required heavy, expensive machinery, or slow, costly manual methods.

It is compactly designed, ruggedly built, occupies minimum floor space and is easily portable. Lubri-cated-for-life, double-sealed, preloaded ball bearings, precision bored seats, precision ground shafts, dy-namically balanced arbor pulleys, and Delta quality construction assure long, trouble-free service.

Priced much lower than any comparable machine, the Delta Belt Grinder will pay for itself in almost any manufacturing operation. Why not investigate it—and start enjoying added profits—today!



It's easy to grind hard-to-reach surfaces. Here, the operator presses against obrasive belt, directly over contact wheel, to clean up "inside" surface.



perated in horizontal position, there's a steady, flat working surface especially suitable for easy, accurate finishing of relatively large surfaces.

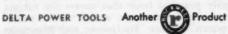


can be held against any part of the abrasive belt in any position required by finishing operation.

There's a Detta Power Tool for your Job-

WOOD OR METAL WORKING

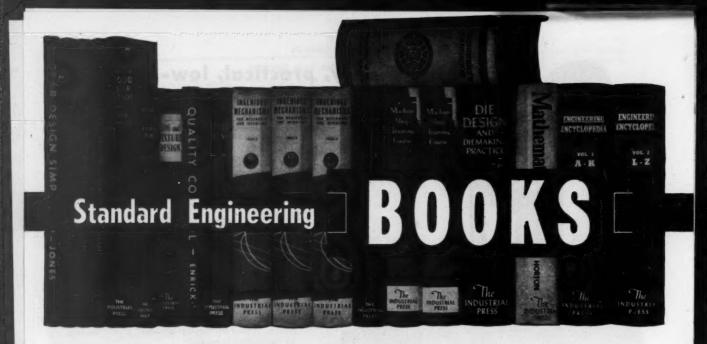
53 MACHINES . 246 MODELS . MORE THAN 1300 ACCESSORIES



For Delte Dealers, see your Classified Phone Directory under "Tools"

DELTA POWER TOOL DIVISION MANUFACTURING COMPANY

614 M NORTH LEXINGTON AVENUE . PITTSBURGH 8. PA.



MACHINERY'S HANDBOOK - 14th Edition

Since its first edition, almost a million copies of this invaluable reference book have been sold. The 14th edition of this world-renowned book contains the latest and most useful machine-designing and machine-shop data available—the kind of information that is needed by everyone who designs or builds machines, tools or mechanical devices. Changes in standards and practices often make old handbooks unsafe to use. Be sure you have the latest information on new or revised standards, as well as complete mechanical and mathemical tables, rules, formulas, and general data—all contained in one handy volume. 1911 Pages. \$8.00 postpaid in U. S. Canadian or foreign postage, 75¢.

DIE DESIGN AND DIEMAKING PRACTICE

Presents in clear, concise fashion, drawings of a tremendous variety of dies, and a vast amount of data representing the combined experience of the best diemakers and die designers in the U. S. In the new 3rd Edition, 141 pages of new material have been added, covering the latest developments. This book has long been a standard reference work, and has been used by some 40,000 diemakers, designers and tool engineers. 1083 Pages. 661 Illustrations. \$7.00 post-paid in U. S. Canadian or foreign postage, \$1.00.

MATHEMATICS AT WORK

A convenient, comprehensive, problem-solving guide written expressly to show how arithmetic, algebra, geometry, trigonometry and logarithms are applied to problems in the metalworking field. Contains a 100-page review of the fundamentals of each branch of mathematics; 482 pages of illustrated mechanical problems, with step-by-step analyses and solutions; 146 pages of standard mathematical tables needed for all types of problem solving. 728 Pages. 196 Illustrations. \$7.00 postpaid in U. S. Canadian or foreign postage, 80\$\splace\$.

MACHINE TOOLS AT WORK

An outstanding selection of machine shop operations illustrating the applications of modern machine tools. The 434 close-up photographs make it a veritable sightseeing tour through the outstanding machine shops of the United States. 544 Pages. \$5.00 postpaid in U. S. Canadian or foreign postage, 80¢.

INGENIOUS MECHANISMS FOR DESIGNERS AND INVENTORS

Accurate, comprehensive and fully illustrated descriptions of new and unusual mechanical movements developed by experienced inventors and machine designers. Now in three volumes, forming a comprehensive encyclopedia of mechanical movements unparalleled in scope and usefulness. Each volume is similar in general character, but describes different mechanisms. Present owners of Volumes I and II will want to add Volume III to their library. Each volume has over 530 pages, with 300 or more illustrations. Single volume, \$6.00. Any two or three volumes \$5.00 each postpaid in U. S. Canadian or foreign postage, 75¢ per book.

MACHINE SHOP TRAINING COURSE

Contains over 1,000 pages of questions and answers carefully selected to deal with the most important elements of machine shop practice. Packed with useful facts and shop rules, and accompanied by clear drawings and photographs. Used as a textbook in many shop training and mechanical engineering courses. Two volumes, \$8.00. Single volume, \$5.00 postpaid in U. S. Canadian or foreign postage, \$1.18.

MECHANICAL DRAWING

A thoroughly practical book that covers the subject fully and presents methods in actual use in manufacturing plants. Covers: Equipment and Materials; Procedure; Printing Processes; Engineering Standards; Sketching and Perspective Drawing, etc. 342 Pages. 179 Illustrations. \$3.00 postpaid in U. S. Canadian or foreign postage, 65¢.

Written by outstanding authorities, and published by the publishers of MACHINERY, these books enable you to find the right answer — quickly — to almost every type of engineering, design and production problem.

for Designers and Builders of Mechanical Products

14,000 GEAR RATIOS

400 pages of tabulated gear ratios and examples—14,000 two-gear and millions of possible four-gear combinations. Includes: Common Fractional Ratios and Decimal Equivalents; Decimal Ratios, Logs and Equivalent Pairs of Gears; Total Number of Teeth with Equivalent Gear Pairs and Ratios; Numbers and Equivalent Gear Factors. Page size, 8½" x 11". \$5.00 postpaid in U. S. Canadian or foreign postage, 80¢.

MANUAL OF GEAR DESIGN

Three books for everyone designing or producing gears. Section 1—Mathematical Tables. Section 2—Formulas and Time-Saving Tables for Spur and Internal Gear Designing Problems. Section 3—Formulas, Charts and Tables for Helical and Spiral Gears. Combination price, 3 sections, \$8.00. Any single section, \$3.00 postpaid in U. S. Canadian or foreign postage, 65¢ per book.

ENGINEERING ENCYCLOPEDIA

A general engineering reference book and mechanical dictionary combined. The two volumes contain 1431 pages of condensed and practical information about 4500 subjects, illustrated by 206 drawings. A world of engineering knowledge that everyone in the mechanical industries should have. Two volumes. \$10.00 postpaid in U. S. Canadian or foreign postage, \$1.18.

GEAR DESIGN SIMPLIFIED

Working rules and formulas for designer and shop man applying to all types of gears. Worked-out examples show exactly how rules or formulas are applied in obtaining essential dimensions, angles and other values. 134 Pages. 210 Drawings. \$4.00 postpaid in U. S. Canadian or foreign postage, 65¢.

JIG AND FIXTURE DESIGN

A comprehensive treatise covering the principles of development and important constructional details of all classes of jigs and fixtures. 382 Pages. 327 Illustrations. \$4.00 postpaid in U. S. Canadian or foreign postage, 70¢.

QUALITY CONTROL

Designed expressly for practical, everyday use and based on plant-tested principles, this book shows how you can get more uniform product quality, prevent excessive spoilage and improve inspection. 122 Pages. 32 Charts and Tables. \$3.00 postpaid in U. S. Canadian or foreign postage, 55\$.

Other INDUSTRIAL PRESS Books

The books illustrated and described here are a few of the outstanding selections from our list of titles. Among the books published by The Industrial Press you may be able to find the exact solution to the problem that is troubling you. Send for our 32-page catalog describing all the books in full.

	CADEA
THE INDUSTRIAL PRESS, 148 Lafer Please send me the books li	yette Street, New York 13, N. Y. M-11/52 isted below: I understand I may return any books within 5 days and money will be refunded.
☐ I enclose \$ payment in	full, including Canadian or foreign postage if necessary.
☐ I enclose down payment of \$ belance in monthly installments.)	(Note: If order amounts to \$6.00 or more, you may pay one-third down and the
Firm purchase order enclosed.	
NAME (Please Print)	POSITION OR TITLE
COMPANY	
CITY	ZONE STATE
HOLLE ADDRESS	
	(Please fill in if you want book sent to your home)

ODDED FORM TOTAL

Profitable investments in practical knowledge

INTENSIFIERS, Hydraulic

Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Farguhar, A. B., Co., 21 Duke St., York, Pa.
Hydraulic Press Mfg. Co., 300 Lincoln Ave.,
Mt. Gilead, Ohio.
Hydrogress, Inc., 350 Fifth Ave., New York 1,
N. Y.

Morgan Engrg. Co., Alliance, Ohio. Watson-Stillman Co., Aldene Rd., Roselle, N. J.

JACKS, Planer

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill. Northwestern Tool & Engrg. Co., 117 Hollier, Dayton, Ohio.

JIG BORER

See Boring Machines, Jig.

JIGS AND FIXTURES

Allied Products Corp., 12677 Burt Rd., Detroit 23, Mich.

Bath, Cyril, Co., 6984 Machinery Ave., Cleveland 3, Ohio.
Columbus Die, Tool & Mch. Co., 955 Cleveland Ave., Columbus, Ohio.
Hartford Special Mchry. Co., 287 Homestead St., Hertford, Conn.
Ingersoll Milling Machine Co., 2442 Douglas St., Rockford, Ill.
Jahn, B., Manufacturing Co., Ellis St., New Britain, Conn.

Britain, Conn.

Northwestern Tool & Engrg. Co., 117 Hollier, Dayton, Ohio. Sheffield Corp., 721 Springfield, Dayton, Ohio. Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill. Sundstrand Machine Tool Co., 2331 11th St., Rockford, Ill.

Vinco Corp., 8855 Schaefer Michana. Datasts.

Vinco Corp., 8855 Schaefer Highway, Detroit 27, Mich.

Woodworth, N. A., Co., 1300 E. Nine Mile Rd., Detroit 20, Mich.

JOINTS, See Fittings, Hydraulic, Pneumatic, Etc.

KEYSEATERS

Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohio. Consolidated Mch. Tool Co., Rochester, N. Y. Davis Keyseater Co., 405 Exchange St., Rochester 8, N. Y. Lappinte Machine Tool Co., 34 Tower St., Hudson, Mass. Mitts & Merrill, 68 Holden St., Saginaw, Mich.

KNURL HOLDERS

Brown & Sharpe Mfg. Co., Providence, R. I. Pratt & Whitney, West Hartford 1, Conn.

KNURLING TOOLS

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicogo, III. Pratt & Whitney, West Hartford 1, Conn. Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

LAPPING MACHINES

Cincinnati Grinders, Inc. (Centerless), Cincinnati, Ohio.
Crane Packing Co., 1800 Cuyler Ave., Chicago, Ill. (Lapmaster Div.).
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
Micromatic Hone Corp., 8100 Schoolcraft, Detroit 4, Mich.
Norton Co., 1 New Bond St., Worcester 6, Mass.

LAPPING PLATES, Hand

Crane Packing Co., 1800 Cuyler Ave., Chicago,

LATHE AND GRINDING DOGS

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, III. Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

LATHE ATTACHMENTS

LATHE ATTACHMENTS

American Tool Works Co., Pearl and Eggleston Aves., Cincinnati, Ohio.

Atlas Press Co., 1253 N. Pitcher St., Kalamazoo, Mich.
Cincinnati Lathe & Tool Co., 3207-3211 Disney St., Oakley, Cincinnati 9, Ohio.
Gisholf Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Hendey Machine Co., Torrington, Conn.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Monarch Machine Tool Co., 27 Oak St., Sidney, Ohio.

Monarch Machine Tool Co., 27 Oak St., Sidney, Ohio.
Pratt & Whitney, West Hartford 1, Conn.
Reed-Prentice Corp., 677 Cambridge St., Worcester, Mass.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Sensca Falls Mch. Co., Seneca Falls, N. Y.
Sidney Machine Tool Co., Sidney, Ohio.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Springfield Mch. Tool Co., Springfield, Ohio.
Sundstrand Mch. Tool Co., 2531 11th St.,
Rockford, Ill.
Turnomat Co., Inc., Brockport, N. Y.
Warner & Swasey Co., 5701 Carnegie Ave.,
Cleveland 3, Ohio.

LATHE CONVERTER

Master Mfg. Co., Hutchinson, Kansas.

LATHES, Automatic

Bullard Co., Brewster St., Bridgeport 2, Conn.
Cleveland Automatic Machine Co., 4932 Beach
St., Cincinnati 12, Ohio.
Cone Automatic Mch. Co., Inc., Windsor, Vt.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Gisholf Machine Co., 1245 E. Washington Ave.,
Madison 10, Wis.
Goss & DeLeeuw Mch. Co., Kensington, Conn.
Jones & Lamson Mch. Co., 160 Clinton St.,
Springfield, Vt.

(Continued on page 346)

High Speed

CONTINUOUS OIL GROOVING

PIECES PER HOUR!

High-production and economical operation are the features of the WICACO CONTINUOUS OIL GROOVER . . . capable of completing as many as 500 grooved pieces per hour in routine practice —even with unskilled labor!

The operator loads and unloads the work without stepping the Machine—a valuable time-saving advantage made possible by the WICACO upright construction of the spindle and stationary chuck. Feed-lever automatically returns to neutral position when cutting tool reaches its proper depth. The spindle—not the chuck—revolves, permitting fast and convenient grooving of a variety of

groove 7/32", maximum width 3/8", grooves may be cut in work from 1/4" I.D. to 4 1/2" I.D.; standard chuck holds work to 4 1/2" O.D.; stroke of spindle from 0" to 7"; floor space 24" dia.; weight of machine about 950 lbs.

Send us sample bearings to cut to specifications. will return them, properly grooved, with a record of the time required and a costestimate. No obligation. Or, write for detailed, well-illustrated Bulletin.



THE WICACO MACHINE CORPORATION WAYNE JUNCTION PHILADELPHIA 44, PA.

SINCE 1868



STANDARD TOOL CO.

3950 CHESTER AVENUE
CLEVELAND 14, OHIO



New York • Detroit • Chicago • Dallas • San Francisco

THE STANDARD LINE: Twist Drills . Reamers . Taps . Dies . Milling Cutters . End Mills . Hobs . Counterbores . Special Tools

Metal Cutting Tools. There is a Standard Distributor Near You and Ready to Serve You.



tighter hold Torrington Swaging Machines offer an ideal method of attaching ferrules and cable ends to wire or rod. Rapid hammer blows (4000 a minute)

tighten the ferrule quickly around

the rod - producing a bond that withstands as much tensile strain as the

inner member alone.

"The Torrington Swaging Machine" tells you w to do a better job of shaping many metal parts, and save money, too. It also describes the complete line of Torrington machines. Write for your free copy...today!

THE TORRINGTON COMPANY Swager Department

558 Field Street . Torrington, Conn. Makers of

TORRINGTON NEEDLE BEARINGS

LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio. Lodge & Shipley Co., 3055 Colerain Ave., Cin-cinnati 25, Ohio. Monorch Machine Tool Co., 27 Oak St., Sidney, Ohio. National Acme Co., 170 E. 131st St., Cleveland, National Acme Co., 170 E. 131st St., Cleveland, Ohio.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.
Porter-Cable Machine Co., Salina St., Syracuse, N. Y.
Potter & Johnston Co., 1027 Newport Ave., Pawtucket, R. I.
Pratt & Whitney, West Hartford I, Conn.
Russell, Holbrook & Henderson, Inc., 292 Madison Ave., New York 17, N. Y.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Snyder Tool & Engineering Co., 3400 E.
Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St.,
Rockford, III.

LATHES, Axle

Consolidated Mch. Tool Corp., Rochester, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and
Edwards Rds., Cincinnati 18, Ohio.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Snyder Tool & Engineering Co., 3400 E.
Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St.,
Rockford, III.

LATHES, Bench

Arries Precision Mch. Works, Waltham, Mass.
Atlas Press Co., 1253 N. Pitcher St., Kalamazoo, Mich.
British Industries Corp., International Mchry.
Div., 164 Duans St., New York, N. Y.
Cosa Corp., 405 Lexington Ave., New York 17,
N. Cyp., 405 N. Y.
Hardinge Bros., Inc., 1418 College Ave., Elmira, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohlo.
Prott & Whitney, West Hartford 1, Conn.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Sheldon Mch. Co., Inc., 4240-4258 N. Knox
Ave., Chicago 41, Ill.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.

LATHES, Boring

Bullard Co., Brewster St., Bridgeport 2, Conn. Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.
Sidney Machine Tool Co., Sldney, Ohio.

LATHES, Crankshaft

Consolidated Mch. Tool Corp., Rochester, N. Y. LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohlio. Snyder Tool & Engineering Co., 3400 E. Lafayette, Detroit 7, Mich. Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

LATHES, Double-End

Cleveland Automatic Machine Co., 4932 Beech St., Cincinnati 12, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y. LeBland, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.
Snyder Tool & Engineering Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, III.

LATHES, Duplicating

H. E. B. Mch. Tools, Inc., 341 Madison Ave., New York 17, N. Y. Hirschmann, Carl, Co., 30 Park Ave., Man-hasset, N. Y. Lehmann Machine Co., 3560 Chouteau Ave., 5t. Louls, Mo. Monarch Machine Tool Co., 27 Oak St., Sidney Ohio.

LATHES, Engine and Toolroom

American Tool Works Co., Pearl and Eggleston Aves., Cincinnati, Ohio. Atlas Press Co., 1253 N. Pitcher St., Kalama-zoo, Mich.

(Continued on page 348)



satisfaction ...for 101 years!







Rise-and-Fall Spindle Longitudinal **Table Travel** Transverse Table Travel

LEVER ACTIONS RAPID





NATIONAL DISTRIBUTORS NICHOLS-MORRIS CORPORATION

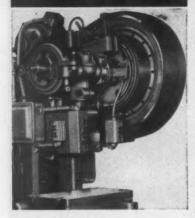
76-E Mamaroneck Ave., White Plains, N. Y.

CONDENSED SPECIFICATIONS

6%" x 21" **Table Working Surface** 10" Longitudinal Table Travel Transverse Table Travel 13" **Vertical Travel of Knee** Rise and Fall of Spindle 415" Selective Speed Ranges up to 5000 R.P.M. Weight 1250 lbs.

MACHINERY, November, 1952-347

MORE Speed - Safety Production with L&J-FAWICK AIR CLUTCHES



Here's the answer to more production - L & J Presses equipped with L&I-Fawick Air Clutches and variable speed drives. This unbeatable combination gives you maximum speed for each operation often 2-1/2 to 3 times normal production, greater safety through rapid, shock-free, full-power operation. Let us show you how these L&J Presses can increase your output of high-speed press work and cut down operating cost.



AIR RELEASE SPRING-SET

Another important L&I safety feature. Brake

automatically applied if air pressure fails - positive, foolproof.

L&J Presses are made in 12 O.B.I. models-back geared and plain flywheel types -8 sizes from 6 to 80 ton capacities. Write for literature.



Axeison Mfg. Co., P. O. Box 15335, Vernon Sta., Los Angeles 58, Calif.
Cincinnati Lathe & Tool Co., 3207-3211 Disney St., Ookley, Cincinnati P, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y. Cosa Corp., 405 Lexington Ave., New York 17, N. Y. Greaves Mch. Tool Co., 2009 Eastern Ave., Cincinnati, Ohio.
H. E., B. Mch. Tool Co., 2009 Eastern Ave., Cincinnati, Ohio.
H. E., B. Mch. Tools, Inc., 341 Madison Ave., New York 17, N. Y. Hendey Machine Co., Torrington, Conn. Hirschmann, Carl. Co., 30 Park Ave., Manhosset, N. Y.
Hendey Machine Co., Torrington, Conn. Hirschmann, Carl. Co., 30 Park Ave., Manhosset, N. Y.
LeBiond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.
Logan Engra, Co., 4901 W. Lawrence Ave., Chicago 30, Ill.
Monarch Machine Tool Co., 27 Oak St., Sidney, Ohio.
Morey Mchry. Co., Inc., 410 Broome St., New York, N. Y.
Nebel Machine Tool Co., 3401 Central Parkway, Cincinnati 25, Ohio.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Pratt & Whitney, West Hartford 1, Conn. Reed-Prentice Corp., 677 Cambridge St., Worcester, Mass.
Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Sheldon Machine Tool Co., 1nc., 4240-4258 N. Knox Ave., Chicago 41, Ill.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Sheldon Machine Tool Corp., 1600 N. Broadway, Albany, N. Y.
South Bend, Ind.
Springfield Mch. Tool Co., Springfield, Ohio.
LATHES, Gap

LATHES, Gap

Axelson Mfg. Co., P. O. Box 15335, Vernon Sto., Los Angeles 58, Calif.
Cincinnati Lathe & Tool Co., 3207-3211 Disney St., Oakley, Cincinnati 9, Ohio.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
H. E. B. Mch. Tools, Inc., 341 Madison Ave., New York 17, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.
Nebel Machine Tool Co., 3401 Central Parkway, Cincinnati 25, Ohio.
Seneca Falls Mch. Co., Seneca Fails, N. Y.
Sidney Machine Tool Co., Springfield, Ohio.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

Consolidated Mch. Tool Corp., Rochester, N. Y. LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio. Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo. Seneca Falls Mch. Co., Seneca Falls, N. Y.

LATHES, Hollow Spindle

Axelson Mfg. Co., P. O. Box 15335, Vernon Sta., Los Angeles 58, Calif.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.

LATHES, Manufacturing Type

Lipe-Rollway Corp., 806 Emerson Ave., Syra-cuse, N. Y. Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.

LATHES, Spinning

Bliss, E. W., Co., 1375 Raff Rd., S. W., Canton, Ohio. Ferracute Machine Co., Bridgeton, N. J.

LATHES, Toolroom

See Lathes, Engine and Toolroom.

LATHES, Turret

Bardons & Oliver, Inc., Ft. W. 9th St, Cleve-land 13, Ohio. (Continued on page 350)

OPTICAL TOOLING

complete range of proven equipment...



New-REPORT 1052 **Optical Tooling**

for Industry

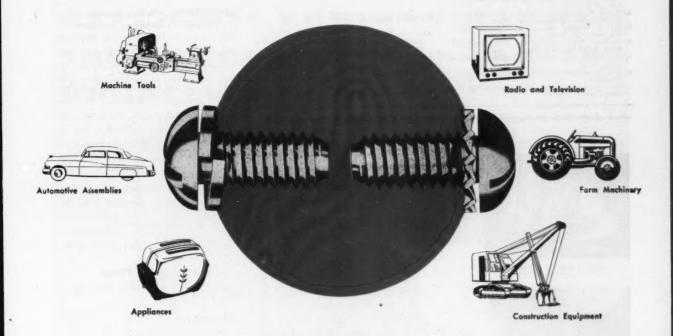


Provides illustrated comprehensive information on Equipment and Accessories, and Application.

Write Dept. M-1152 For Free Copy

ENGIS EQUIPMENT CO.

Reduce production cost



in ALL fields of manufacturing

with EATON SPRINGTITES & SEMS!

WHEREVER YOU use bolted assemblies, there are economies to be gained through the use of EATON Springtites and Sems. Under actual production line conditions, these top-quality bolts or thread-cutting screws that are pre-assembled with Reliance Spring lock washers or multitooth washers cut assembly operations from 8 to 3 motions. Reduce production costs and improve product quality. One item, instead of two, cuts paper work and balances inventory

Why not gain these savings in your own assembly operations? Engineering data and samples furnished upon request.



For the Finest-Specify EATON SPRINGTITES and SEMS

MANUFACTURING COMPANY, RELIANCE DIVISION

OFFICE AND PLANTS . MASSILLON, OHIO
SALES OFFICES NEW YORK + CLEVELAND . DETROIT . CHICAGO . ST LOUIS
SAN FRANCISCO . MONTREAL

British Industries Corp., International Mchry. Div., 164 Duane St., New York, N. Y. Brown & Sharpe Mfg. Co., Providence, R. I. Bullard Co., Brewster St., Bridgeport 2, Conn. Cosa Corp, 405 Lexington Ave., New York 17, N. Y.

Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Hardinge Brothers, Inc. (Bench or Cabinet Mounting), 1418 College Ave., Elmira, N. Y.
Hirschmann, Carl, Co., 30 Park Ave., Manhaset, N. Y.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.
Millholland, W. K., Mchry. Co., 6402 Westfield Bivd., Indianapolis 5, Ind.
Morey Mchry. Co., Inc., 410 Broome St., New York, N. Y.
Murad Developments Ltd., Aylesbury, Bucks, England.
Orbon, Kurt, Co., Inc., 205 East 42nd St.,

Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.

Potter & Johnston Co. (Automatic), 1027 New-port Ave., Pawfucket, R. I. Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.

35, Mass.
Simmons Mch. Tool Corp., 1600 N. Broadway,
Albany, N. Y.
South Bend Lathe Works, 425 E. Madison St.,
South Bend, Ind.
Springfield Mch. Tool Co., Springfield, Ohio.
Warner & Swasey Co., 5701 Carnegie Ave.,
Cleveland 3, Ohio.

LATHES, Vertical Turret

American Steel Foundries, King Mch. Tool Div., Poddock Rd. and Tennessee Ave., Cincin-nati, Ohio. Bullard Co., Brewster St., Bridgeport 2, Conn. Lehmann, J. M., Co., Inc., 55 New York Ave., Lyndhurst, N. J. Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y. Rogers Machine Works, Inc., Buffalo 10, N. Y.

LEVELS

Builard Co., Brewster St., Bridgeport 2, Conn. Millers Falls Co., Greenfield, Mass. Pratt & Whitney, West Hartford 1, Conn. Starrett, The L. S., Co., Athol, Mass.

LOCKNUTS

Standard Locknut & Lockwasher, Inc., 510 N. Capitol Ave., Indianapolis, Ind.

LUBRICANTS, Including Extreme Pressure (EP) Machinery Lubricants

Cities Service Oil Co., 70 Pine St., New York, N. Y. N. Y.
Houghton, E. F., & Co., 303 W. Lehigh Ave.,
Philiadelphia, Pa.
Lubriplate Div., Fiske Bros. Refining Co., 129
Lockwood St., Newark 5, N. J.
Pure Oil Co., 35 E. Wacker Drive, Chicago, III.
Shell Oil Co., 50 West 50th St., New York
N. Y.
Sherloir, Refining Co., 630 5th Ave. New York Sinclair Refining Co., 630 5th Ave., New York, N. Y.

N. Y.
Standard Oil Co. (Indiana), 910 S. Michigan,
Chicago, Ill.
Stuart, D. A., Oil Co., Ltd., 2739 S. Troy St.,
Chicago 23, Ill.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.
Texas Co., 135 E. 42nd St., New York, N. Y.
Tide Warter Associated Oil Co., 17 Battery
Place, New York, N. Y.

LUBRICATING SYSTEMS

Bowser, Inc., 1365 E. Creighton Ave., Fort Wayne, Ind. Farval Corp., 3249 E. 80th St., Cleveland, Ohio. Modison-Kipp Corp., Modison, Wis. Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill. Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.

MACHINISTS' SMALL TOOLS

See Calipers, Hammers, Wrenches, Drills, Taps, Etc.

MANDREIS

See Arbors and Mandrels.

MARKING MACHINES AND DEVICES

Colonial Broach Co., P. O. Box 37, Harper Sta., Detroit, Mich.

MEASURING MACHINES AND INSTRUMENTS, Precision

Crane Packing Co., 1800 Cuyler Ave., Chicago, Packing Co., 1800 Cuyler Ave., Chicago, III.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Neise, Karl A., Dept. M, 381 Fourth Ave.,
New York 16, N. Y.
Norma-Hoffmann Bearings Corp., Stamford,
Conn.
Pratt & Whitney, West Hartford 1, Conn.
Scherr, George, Co., Inc., 200 Lafayette St.,
New York 12, N.
Schefield Corp., 721 Springfield, Dayton, Ohio.
Starrett, The L. S., Co., Athol, Mass.
Van Keuren Co., 176 Waltham St., Watertown,
Boston, Mass.
Vinco Corp., 8855 Schaefer Highway, Detroit
27, Micn.

MEASURING WIRES, THREAD, SPLINE AND GEAR

Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass.

METAL, Bearings

See Bearings, Bronze, Babbitt, Etc. and Bushings, Brass, Bronze, Etc.

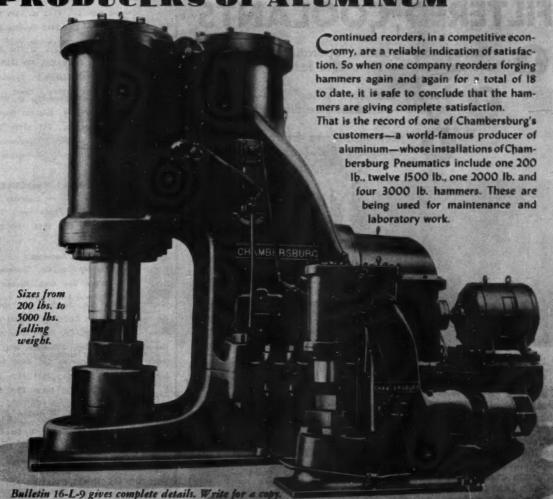
See Recording Instruments.

MICROMETERS

Ames, B. C., Co. (Dial), Waltham 54, Mass. Bath, John, Co., Inc., Worcester, Mass. Brown & Sharpe Mfg. Co., Providence, R. I. (Continued on page 352)

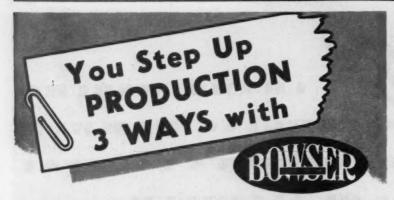


THE 18th CHAMBERSBURG PNEUMATIC FORGING HAMMER FOR ONE OF AMERICA'S LARGEST PRODUCERS OF ALUMINUM



CHAMBERSBURG ENGINEERING COMPANY . CHAMBERSBURG, PENNA

CHAMBERSBURG THE HAMMER BUILDERS



FILTERED COOLANTS

- Cutting and grinding operations are as much as 15 to 20% faster.
 - Longer tool and wheel life—up to 25%—cuts machine downtime.
 - Rejections are frequently reduced 50% or more.



Bowser filtered cutting oil filters prevent abrasive materials from being carried back to the work — increase tool and grin ding wheel life—even sterilize the oil to remove skin-infecting bacteria which cause dermatitis.

CONTINUOUS

There's a Bowser system ideally suited for those critical grinding and cutting operations requiring continuous coolant filtration for individual machines—or large groups, such as the installation shown at the right.



Our nearest sales engineer will welcome an opportunity to discuss your coolant filtration problems.

May he call at your convenience?

BOWSER, INC., 1313 Greighten Avenue, Fort Wayne 2, Indiana
Respond Offices a Affanta a Chicago a Claveland a Sealing
Respond Offices a Affanta a Chicago a Claveland a Sealing
Respond Offices a Affanta a Chicago a Claveland a Sealing
Respond Offices a Affanta a Chicago a Chicago a Manufilma Chicago and Chi

Inter-Continental Trading Corp., 90 West St., New York 6, N. Y.
Millers Falls Co., Greenfield, Mass., Neise, Karf, A., Dept. M., 381 Fourth Ave., New York 16, N. Y.
Pratt & Whitney, West Hartford 1, Conn. Scherr, George, Co., Inc., 200 Larayette St., New York 12, N. Y.
Starrett, The L. S., Co., Athol, Mass.
Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass.

MICROSCOPES, Toolmakers

Engis Equipment Co., 431 S. Dearborn St., Chicago 5, III. Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

MILLING ATTACHMENTS

Brown & Sharpe Mfg. Co., Providence, R. I. Cincinnati Milling Machine Co., Cincinnati, Ohio.
Consolidated Machine Tool Corp., Rochester, N. Y.
Gorton, George, Mch. Co., 1110 W. 13th St., Racine, Wis.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Kempsmith Machine Co., 1819 S. 71st St., Milwaukee 14, Wis.
Northwestern Tool & Engrg. Co., 117 Hollier, Dayton, Ohio.
Porter-Cable Machine Co., Salina St., Syracuse, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Reed-Prentice Corp., 677 Cambridge St., Worcester, Mass.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Van Keuren Co., 176 Waitham St., Watertown, Boston, Mass.
Van Norman Co., 3640 Main St., Springfield 7, Mass.

MILLING AND CENTERING MACHINES

Davis & Thompson Co., 6411 W. Burnham St., Milwaukee 14, Wis. Jones & Lamson Mch. Co. (Automatic), 160 Clinton St., Springfield, Vt. Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

MILLING MACHINES, Automatic

Cincinnati Milling Machine Co., Cincinnati, Ohio.
Consolidated Machine Tool Corp., Rochester, N. Y.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich. Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
Kearney & Trecker Corp., Milwaukee, Wis. Pratt & Whitney, West Hartford I, Conn.
Snyder Tool & Engineering Co., 3400 East Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

MILLING MACHINES, Bench

Atlas Press Co., 1253 N. Pitcher St., Kalamazoo, Mich. Hardinge Bros., Inc. (Bench or Pedestal Type), 1418 College Ave., Elmira, N. Y. Pratt & Whitney, West Hartford 1, Conn.

MILLING MACHINES, Circular Continuous

Consolidated Machine Tool Corp., Rochester, N. Y. Davis & Thompson Co., 6411 W. Burnham St., Milwaukee 14, Wis. Espen-Lucas Mch. Works, Front St. and Girard Ave., Philadelphia, Pa. Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill. Kearney & Tracker Corp., Milwaukee, Wis. Snyder Tool & Engineering Co., 3400 E. Lafayette, Detroit 7, Mich. Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

MILLING MACHINES, Duplex

Cincinnati Milling Machine Co., Cincinnati,

(Continued on page 354)

0

- ARBOR PRESSES, 32 stock models—plain lever, simple ratchet, combination compound and simple ratchet—bench and floor types. Front and side gib adjustments maintain perfect alignment. Deliver up to 15 tons pressure.
- FOOT PRESSES, sturdily constructed of semi-steel for ease and speed of operation; precision-machined for long, trouble-free operation. Foot presses are available in 10 bench and floor models. Deliver up to 3½ tons pressure.
- DRILL PRESSES, available in 28 models of 15" presses in single and multiple spindle; tilting table and production models, bench and floor types. Rugged in construction and built throughout for long years of dependable service.

- POWER AND FOOT SQUARING SHEARS, 8 ruggedly-built models shear up to 18 gauge mild steel; available in cutting widths 22 to 52 in. Power models feature non-repeat mechanism, easily set for continuous operation.
- AIR PRESSES are built especially for heavy, continuous industrial operation. Compact, rugged in design, they are available in 20 models, bench or floor types, 1/2 to 31/2 tons capacity, with built-in electric or air controls, single or dual type.
- BAND SAWS, built like finished machine tools in every sense; available in 4 models of harizontal cut-off saws for dry or wet cutting, with ar without coolant system. Capacity: 6" round end 6" x 12" rectangular stock.
- POWER PRESSES, Open-back inclinable, standard and deep-throat production models, are offered in 13 bench and floor models, rated from 3 to 18 tons capacity. New Model 59 features the exclusive Famco "Electromatic" clutch, the revolutionary, electrically controlled jaw clutch.

FAMCO MACHINE COMPANY

Consolidated Machine Tool Corp., Rochester,

N. Y.
Espen-Lucas Mch. Works, Front St. and Girard
Ave., Philadelphia, Pa.
Ingersoll Milinia Mch. Co., 2442 Douglas St.,
Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Snyder Tool & Engineering Co., 3400 E.
Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St.,
Rockford, Ill.
U. S. Tool Co., Inc., 255 North 18th St.,
Ampere, N. J.

MILLING MACHINES, Hand

Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Nichal-Morris Corp., 50 Church St., New York, N. Y. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J. Ampere, N. J. Van Norman Co., 3640 Main St., Springfield 7, Mass. MILLING MACHINES, Horizontal, Plain and Universal

Austin Industrial Corp., 76 Mamaroneck Ave., White Piains, N. Y. Brown & Sharpe Mfg. Co., Providence, R. I. Cincinnati Milling Machine Co., Cincinnati, Cincinnati Milling Machine Corp., Rochester, N. Y.
Consolidated Machine Tool Corp., Rochester, N. Y.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
De Vlieg Machine Co., 450 Fair Ave., Ferndale, Detroit 20, Mich.
Corton, Geo., Mch. Co., 1110 W. 13th St., Rocine, Wis.
Greaves Mch. Tool Co., 2009 Eastern Ave., Detroit 20, Mich.

Gorton, Geo., Mch. Co., 1110 W. 13th St.,
Racine, Wis.

Greaves Mch. Tool Co., 2009 Eastern Ave.,
Cincinnati, Ohio.
Ingersoll Milling Mch. Co., 2442 Douglas St.,
Rockford, Ill.

Kearney & Trecker Corp., Milwaukee, Wis.
Kempsmith Machine Co., 1819 S. 71st St.,
Milwaukee 14, Wis.

Marca Mchry. Corp., 1819 Broodway, New
York, N. Y.

Neise, Karl A., Dept. M., 381 Fourth Ave.,
New York 16, N. Y.

Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Prott & Whitney, West Hartford 1, Conn.
Sheldon Machine Co., Inc., 4240-4258 N. Knox Ave., Chicago 41, III.
Simmons Mch. Tool Corp., 1600 N. Broadway, Albany, N. Y.
Snyder Tool & Engineering Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rackford, III.
Van Norman Co., 3640 Main St., Springfield 7, Mass.

MILLING MACHINES, Lincoln Type

Brown & Sharpe Mfg. Co., Providence, R. I. Sundstrand Mch. Tool Co., 2531 11th St., Rockford, III.

MILLING MACHINES, Planer Type

Consolidated Mch. Tool Corp., Rochester, N. Y. Espen-Lucas Mch. Warks, Front St. and Girard Ave., Philadelphia, Pa. Giddings & Lewis Machine Tool Co., Fond du Lac, Wis. Gray, G. A., Co., Woodburn Ave. and Penn. R. R., Evanston, Cincinnati, Ohio. Ingersoli Milling Mch. Co., 2442 Douglas St., Rockford, Ill. Kearney & Trecker Corp., Milwaukee, Wis. Pratt & Whitney, West Hartford 1, Conn.

MILLING MACHINES, Profile

Cincinnati Milling Machine Co., Cincinnati, Cosa Corp., 405 Lexington Ave., New York 17, N. Y. Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich. 32, Mich.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Gorton, Geo., Mch. Co., 1110 W. 13th St.,
Racine, Wis.
Orban, Kurt, Co., Inc., 205 East 42nd St.,
New York 17, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Sundstrand Mch. Tool Co., 2531 11th St.,
Rockford, III.

MILLING MACHINES, Ram Type Universal

Von Norman Co., 3640 Main St., Springfield 7, Mass.

MILLING MACHINES, Turret Type

Bridgeport Machine, Inc., Linley Ave., Bridgeport, Conn.

MILLING MACHINES, Vertical

MILLING MACHINES, Vertical
British Industries Corp., International Mchry.
Div., 164 Duane St., New York, N. Y.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Machine Co., Cincinnati,
Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Gorton, Geo., Mch. Co., 1110 W. 13th St.,
Racine, Wis.
Ingersoll Milling Mch. Co., 2442 Douglas St.,
Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Marac Mchry. Co., 1819 Broadway, New York
N. Y.
Neise, Karl A., Dept. M, 381 Fourth Ave.,
New York 16, N. Y.
Orban, Kurt, Co., Inc., 205 East 42nd St.,
New York 17, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Reed-Prentice Corp., 677 Cambridge St., Worcester, Mass.
Snyder Tool & Engineering Co., 3400 E.
Lafayette, Detroit 7, Mich.
Sundstrand Machine Tool Co., 2531 11th St.,
Rockford, Ill.

MODEL AND EXPERIMENTAL WORK

See Special Machinery and Tools.

MOLD AND DIE COPYING MACHINES

Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis. Pratt & Whitney, West Hartford 1, Conn.

MOLDING MACHINES, Plastic

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio. annifin Corp., 1101 S. Kilbourn Ave., Chicago,

(Continued on page 356)



Here's what the Tool Room Superintendent at the Tool Steel Gear and Pinion Co., Cincinnati, Ohio says:

"Since installation this Standard Tool Grinder "Since installation this Standard Loot Grinder has had no downtime . . . required no maintenance other than routine. We use the machine daily, sometimes continuously on production wet-grinding of carbide tipped hub-turning, offset turning, boring and other high-speed steel tools. It's by far the best precision grinder we've used."

Outstanding performance? No . . . just typical of the Standard Twin Wheel Tool Grinder. Available in 10" and 14" wheel sizes; wet or dry. No spray or splash when wet-grinding. Two operators can grind at once. Conserves floor space. Write for Bulletin TW today for full details.

standardize with . .

grinding costs way down, less

operator fatigue, greater wheel life, increased production.

the STANDARD electrical tool co. 2500 RIVER RD. . CINCINNATI 4 . OHIO

WANT TO TRIM YOUR CUTTING COSTS: CALL YOUR ATKINS DISTRIBUTOR!

for money-saving, metal-cutting
...standardize with

Silver Steel

• Check your Atkins Distributor before you order another metal-cutting tool. He knows metal cutting he knows all saw operations—and he's backed by Atkins field engineers who are experts in cutting costs.

Atkins gives you a complete line of Silver Steel segmental cold saws, solid tooth circulars, band saws, hacksaw blades, files—everything you need for sawing ferrous, non-ferrous and composition materials and for your maintenance shop. More important, Atkins gives you the quality line—tools that increase production; require fewer changeovers, less power and attention in operation. This means you save time on every shift, save money on every cut.

Try Atkins Silver Steel on your most difficult cutting job. See how you can trim costs throughout your plant with Atkins—your one dependable source for all standard metal-cutting tools.





ATKINS SAW DIVISION . BORG-WARNER CORPORATION

America's Quality Line
of Cutting Equipment Since 1857

Saws, machine knives, files, power and hand hacksaw blades—for production, maintenance and other operations—for metals, woods and plastics.



TO THE DESIGNATION OF THE PARTY OF THE PARTY

Get more out of your machine tools . . . raise your production curve . . . with Gorham "M-40-B" turning tools! Use "M-40-B" wherever the application of a Super High Speed Steel is indicated, as in machining heat treated alloy steels with large amounts of stock removal at high surface speeds.

"M-40-B" is a Super Moly grade with performance characteristics comparable to those of super tungsten high speed steel. It has extremely high red hardness, high Rockwell hardness, and offers maximum toughness and abrasion resistance. You can take heavy roughing cuts with it at high surface speeds and feeds . . . use it for high speed finish cuts as well.

"M-40-B" comes in square tool bits, 11 stock sizes, and in 23 stock sizes of rectangular turning tools. Bits and turning tools are accurately ground, uniformly hardened, ready to sharpen. Special sizes and shapes to your order. Illustrated with prices are three popular size "M-40-B" tool bits. See your distributor, or send direct for a trial order.

"M-40-B" is one of three cutting tool materials developed by Gorham. Others are Gorham "Standard", for the commercial field, and "Gormet", for turning soft or abrasive stock. They're completely described, with size and price lists, in a new free bulletin. Send for your copy today.



Gorham TOOL COMPANY

"EVERYTHING IN STANDARD AND SPECIAL CUTTING TOOLS"

14405 WOODROW WILSON • DETROIT 3, MICHIGAN

WEST COAST WAREHOUSE: 576 North Prairie Ave., Hawthorne, Calif.

Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio. Reed-Prentice Corp., 677 Cambridge St., Worcester, Mass. Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, III. Watson-Stillman Co., Aldene Rd., Roselle, N. J.

MOLYBDENUM

Climax Molybdenum Co., 500 5th Ave., New York, N. Y.

MOTORS, Electric

Delco Products Div., General Motors Corp., 321 E. First St., Dayton, Ohio. General Electric Co., Schenectady, N. Y. Reliance Electric & Engrg. Co., Collinwood Sta., 1088 Ivanhoe Rd., Cleveland, Ohio.

MOTORS, Hydraulic

Gerotor May Corp., Oliver St. and Maryland Ave., Baltimore, Md. Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.

MULTIPLE-SLIDE FORMING MACHINES

Nilson Machine Co., A. H., 1506 Railroad Ave., Bridgeport, Coin. U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

NIBBLING MACHINES

Campbell Machine Div., American Chain & Cable Co., Inc., 929 Connecticut Ave., Bridgeport, Conn., Waies-Strippit Corp., North Tonawanda, N. Y.

NIBBLING MACHINES, Nickel

International Nickel Co., Inc., 67 Wall St., New York, N. Y.

NIPPLE THREADING MACHINERY

Cleveland Automatic Machine Co., 4932 Beech St., Cincinnati 12, Ohio. Landis Machine Co., Inc., Waynesboro, Pa.

NUT MAKING MACHINERY

National Machinery Co., Greenfield and Stanton Sts., Tiffin, Ohio.

NUT SETTING EQUIPMENT

See Screw Driving and Nut Setting Equipment.

NUT TAPPERS

See Bolt and Nut Machinery.

NUTS, Cold Forged, Wing and Cap

Chicago Screw Co., Bellwood, III.
Parker-Kalon Corp., 200 Varick St., New York
14, N. Y.
Republic Steel Corp. (Union Drawn Steel Div.),
Republic Bidg., Cleveland 1, Ohio.
Union Drawn Steel Co. Div., Republic Steel
Corp., Massillon, Ohio.

NUTS, Self-Locking

Grip Nut Co., 310 S. Michigan Ave., Chicago 4,

NUTS, Thumb or Wing and Cap

Northwestern Tool & Engrg. Co., 117 Hollier, Dayton, Ohio. Republic Steei Corp., Bolt and Nut Div., Republic Bldg., Cleveland 1, Ohio. Williams, J. H., & Co., 400 Vulcan St., Buffale 7, N. Y.

OIL CUPS

Gits Bros. Mfg. Co., 1846-62 Kilbourn Ave., Chicago, III.

OIL EXTRACTORS AND CLEANERS

Barnes Drill Co. (Magnetic), 814 Chestnut, Rockford, Ill. De Laval Separator Co., Poughkeepsie, N. Y. (Continued on page 358) Quick-As-Wink Double Solenoid Air Valves on Coil Strapping and Oiling Line.

Quick-As-Wink Control Valves

fast, positive
dependable
action for
single or sequence
machine movements

● Whether the machine movements in your plant are of the relatively simple "on-off" variety, or complicated interconnected sequence operations, you will get a maximum of long, efficient service, without break-downs, tie-ups or lost time, by standardizing on Quick-As-Wink Control Valves throughout your plant.

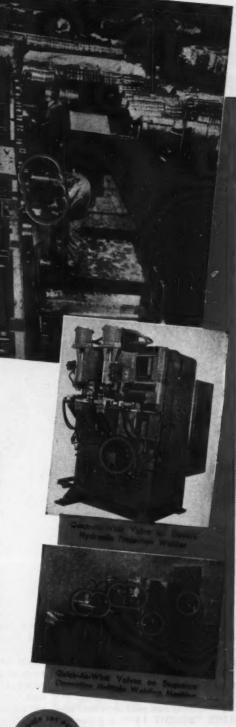
Quick-As-Wink Valves are designed—and built—to maintain highest standards of continuous, trouble-free service. All parts are in pressure balance eliminating any tendency to creep or crawl. There is no metal to metal seating, minimizing wear and reducing maintenance costs. All parts are standardized and readily interchangeable avoiding the delays of returning valves to the factory for servicing, and the expense of maintaining large standby inventories.

Standardize on Quick-As-Wink—and get all the advantages that only Quick-As-Wink Control Valves can give you.

Control Valves

Hand, Foot, Cam, Diaphragm and Solenoid Operated

Mfd. by C. B. HUNT & SON, INC., 1911 East Pershing St., Salem, Ohio





PERKINS MAKES to customers' specifications, in all materials, metallic and nonmetallic bevel gears, ratchets, ground thread worms, spiral gears, helical gears, spur gears with shaved or ground teeth. Have us quote on your requirements.

A new product is the PERKINS PRECISION SPRING COILER. This coiler (patent applied for) turns out precision springs—any type, shape, size from wire sizes .005 to .125. Complete data and prices upon request.

Another new product — the PER-KINS "BENDIT 15"— a patented metal forming machine which bends and shapes sheets, rods; strips tubing into innumerable complex as well as simple forms that would be difficult or even impossible to make by other means. Eliminates need for expensive tools or specialized skills. Height 47", net weight 200 lbs. Write us today for descriptive catalog, prices, etc.

PERKINS MACHINE & GEAR CO.

WEST SPRINGFIELD, MASSACHUSETTS

OIL GROOVERS

Wicaco Machine Co., Stenton Ave. and Louden St., Philadelphia, Pa.

OIL-HOLE COVERS

Gits Bros. Mfg. Co., 1846-62 Kilbourn Ave., Chicago, III.

OIL SEALS

Crane Packing Co., 1800 Cuyler Ave., Chicago, III. Garlock Packing Co., Palmyra, N. Y.

OILERS AND LUBRICATORS

Gits Bros. Mfg. Co., 1846-62 Kilbourn Ave., Chicago, III. Madison-Kipp Corp., Madison, Wis.

OILS, Cutting

See Cutting and Grinding Fluids.

OILS, Lubricating

Cities Service Oil Co., 70 Pine St., New York, N. Y.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Heughton & Co., E. F., 303 W. Lehigh Ave., Philadelphia, Pa.
Pure Oil Co., 35 E. Wacker Drive, Chicago, Ill.
Shell Oil Co., 50 West 50th St., New York, N. Y.
Sinclair Refining Co., 630 5th Ave., New York, N. Y.
Standard Oil Co. (Indiana), 910 S. Michigan, Chicago, Ill.
Stuart Oil Co., Ltd., D. A., 2739 S. Troy St., Chicago 23, Ill.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.
Texas Co., 135 E. 42nd St., New York, N. Y.
Tide Water Associated Oil Co., 17 Battery Place, New York, N. Y.

OILS, Quenching and Tempering

Cities Service Oil Co., 70 Pine St., New York, N. Y.
Houghton & Co., E. F., 303 W. Lehigh Ave., Philadelphia, Pa.
Sheil Oil Co., 50 West 50th St., New York, N. Y.
Sinclair Refining Co., 630 5th Ave., New York, N. Y.
Standard Oil Co. (Indiana), 910 S. Michigan, Chicago, Ill.
Stuart Oil Co., Ltd., D. A., 2739 S. Tray St., Chicago 23, Ill.

OILS, Soluble

See Compounds, Cutting, Grinding, Metal Drawing, Etc.

OPTICAL FLATS

Crane Packing Co., 1800 Cuyler Ave., Chicago,

ORDNANCE MACHINES, Special

Rehnberg-Jacobson Mfg. Co., 2135 Kishwaukee St., Rockford, III.

PACKING, Leather, Motal, Rubber, Asbestos, Etc.

Crane Packing Co., 1800 Cuyler Ave., Chicago, III.
Garlock Packing Co., Palmyra, N. Y.
Houghton & Co., E. F., 303 W. Lehigh Ave.,
Philadelphia, Pa.

PARALLELS

Brown & Sharpe Mfg. Co., Providence, R. I. Rahn Granite Surface Plate Co., 637 N. Western Ave, Dayton, Ohio.
Starrett, The L. S., Co., Athol. Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Walker, O. S., Co., Inc., Worcester, Mass.

PATTERNS, Wood and Metal

Mummert-Dixon Co., Hanover, Pa.

PHOSPHOR BRONZE-See Bronze.

PILLOW BLOCKS

Boston Gear Works, 3200 Main St., North Quincy 71, Mass. (Continued on page 360)

WERNER

ILLERS

From PIGMY Size 0 to GIANT 5

VERTICAL: Size 0 to 5 Table sizes 22" x7" up to 90" x 20"

PLAIN: Size 0 to 4 Table sizes 22" x7" up to 76" x 151/2"

UNIVERSAL: Size 1 to 4 Table sizes 29" x8" up to 76" x15"

MANUFACTURING MILLERS: 2-19, 3-25 Sizes 1, 2, 3



No. 0 Vertical



No. 4 Vertical

3-25 Manufacturing

No. 0 Horizontal



PROMPT and **REASONABLE DELIVERIES**

For further information about these and other machines contact Dept. M

MARAC MACHINERY CORP. 1819 B'WAY . N.Y. 23

MACHINERY, November, 1952-359



FREE SAMPLES and socket screw catalog. Write us.



BRISTOL COMPANY, Socket Screw Division, Waterbury 20, Conn.

C & C Sales Corp., 1771 Broadway, New York 19, N. Y. Norma-Hoffmann Bearings Corp., Stamford, Conn. Shafer Bearing Corp., Downers Grove, III. S K F Industries, Inc., P. O. Box 6731, North Philadelphia, Pa. Standard Pressed Steel Co., Jenkintown, Pa.

PIPE, BRASS AND COPPER

American Brass Co., 25 Broadway, New York, N. Y. N. Y.
Chase Brass & Copper Co., Inc., 1949 Rodney
St., Waterbury 20, Conn.
Orban, Kurt, Co., Inc., 205 East 42nd St.,
New York 17, N. Y.
Revere Copper & Brass Inc., 230 Park Ave.,
New York, N. Y.

PIPE STEEL

Allegheny Ludium Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Orban, Kurt, Co., Inc., 205 East 42nd St.,
New York 17, N. Yepublic Bldg., Cleveland
1, Ohio.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th
St., Chicago 18, Ill.
United States Steel Corp., National Tube Co.
Div., 436 7th Ave., Pittsburgh, Pa.

PIPE THREADING AND CUTTING

Cleveland Automatic Machine Co., 4932 Beech St., Cincinnati 12, Ohio. Landis Machine Co., Inc., Waynesboro, Pa.

PIPE TONGS

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, III. Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

PLANER ATTACHMENTS

Consolidated Mch. Tool Corp., Rochester, N. Y. Giddings & Lewis Machine Tool Co., Fond du Lac, Wls. Gray, G. A., Co., Woodburn Ave. and Penn. R. R., Evanston, Cincinnati, Ohio. Northwestern Tool & Engrg. Co., 117 Hollier, Dayton, Ohio. Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, III.

PLANERS, Double Housing and Openside

Baldwin-Lima-Hamilton Corp., Philadelphia 42, Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Cleveland Punch & Shear Works Co., 3917 St.
Clair Ave., N. E., Cleveland, Ohio (Plate).
Consolidated Mch. Tool Corp. (Incl. Plate).
Rotary and Crank Types), Rochester, N. Y.
Giddings & Lewis Mochine Tool Co., Fond du Lac, Wis.
Gray, G. A., Co., Woodburn Ave. and Penn.
R. R., Evanston, Cincinnati, Ohio.
Rockford Machine Tool Co., 2500 Kishwaukee
St., Rockford, III.

PLASTIC AND PLASTIC PRODUCTS

Bakelite Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.

PLATE ROLLS

Baldwin-Lima-Hamilton Corp., Lima-Hamilton Div., Hamilton, Ohio. Bethlehem Steel Co., Bethlehem, Pa. Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio. Consolidated Mch. Tool Corp., Rochester, N. Y. Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, III.

PLATES, Angle

Rahn Granite Surface Plate Co., 637 N. Western Ave., Dayton, Ohio.

PLATES, Surface

Brown & Sharpe Mfg. Co., Providence, R. I.
Challenge Machinery Co., Grand Haven, Mich.
Delta Power Tool Div., Rockwell Mfg. Co.,
6146 N. Lexington Ave., Pittsburgh 8, Pa.
Prott & Whitney Div., West Hartford 1, Conn.
Rahn Granite Surface Plate Co., 637 N. Western Ave., Dayton, Ohio.
Scherr, George, Co., Inc., 200 Lafayette St.,
New York 12, N. Y.

(Continued on page 362)



Taft-Peirce Mfg. Co., Woonsocket, R. I. U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J. Vinco Corp., 8855 Schaefer Highway, Detroit 27, Mich.

PNEUMATIC EQUIPMENT

Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y. Honno Engineering Works, 1752 Elston Ave., Chicago, III. III.
Ingersoll-Rand Co., Phillipsburg, N. J.
Logansport Machine Co., Inc., Logansport, Ind.
Mead Specialties Co., 4114 North Knox Ave.,
Chicago 41, III.
Onsrud Machine Works, Inc., 3940 Palmer St.,
Chicago, III.

POLISHING LATHES AND MACHINES

Black & Decker Mfg. Co., E. Penna. Ave., Towson, Md. Gardner Machine Co. (Div. Landis Tool Co.), 414 E. Gardner St., Beloit, Wis. Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich. Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio. Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.

Hirschmann, Carl, Co., 30 Park Ave., Manhosset, N. Y.

Millers Folls Co., Greenfield, Mass.

Standard Electrical Tool Co., 2488-90 River Rd.,
Cincinnati 4, Ohio.

Sundstrand Machine Tool Co., 2531 11th St.,
Rockford, Ill.

POLISHING TOOLS, Portable

Jarvis, Charles L., Co., Middletown, Conn. Sundstrand Machine Tool Co., 2531 11th St., Rockford, III.

POWER UNITS, Hydraulic

See Hydraulic Power Units or Tool Heads

PRESSES, Air

Famco Machine Co., 3134 Sheridan Rd., Kenasha, Wis,

PRESSES, Arbor

Baldwin-Lima-Hamilton Corp., Lima-Hamilton Div., Hamilton, Ohio. Dake Engine Co., 604 Seventh St., Grand Div., Hamilton, Ohio.
Dake Engine Co., 604 Seventh St., Grand Haven, Mich.
Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.
Farquhar Co., A. B., 21 Duke St., York, Pa. Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, III.
hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Logansport Machine Co., Inc., Logansport, Ind.
Tomkins-Johnson Co., 614 No. Mechanic St.,
Jackson, Mich.
Watson-Stillman Co., Aldene Rd., Roselle, N. J.
Wilson, K. R., 215 Mani St., Buffalo, N. Y.

PRESSES, Broaching

American Broach & Mch. Co., Ann Arbor, Mich. Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio. Ohio.
Colonial Broach Co., Detroit 13, Mich.
Dake Engine Co., 604 Seventh St., Grand
Haven, Mich.
Farquhar Co., A. B., 21 Duke St., York, Pa.
Ferracute Machine Co., Bridgeton, N. J.
Lake Erie Engrg. Co., Kenmore Station, Buffolo, N. Y.
Lapointe Machine Tool Co., 34 Tower St.,
Hudson, Mass.
Watson-Stillman Co., Aldene Rd., Roselle, N. J.

PRESSES, Extrusion

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincin-Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Chambersburg Engrg. Co., Chambersburg, Pa. Farquhar Co., A. B., 21 Duke St., York, Pa. Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Hydropress, Inc., 350 Fifth Ave., New York 1, N. Y.
Lake Erie Engrg. Co., Kenmore Station, Buffalo, N. Y.
Watson-Stillman Co., Aldene Rd., Roselle, N. J.

PRESSES, Foot

Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio. Ohio.
Famco Machine Co., 3134 Sheridan Rd.,
Kenosha, Wis.
Ferracute Machine Co., Bridgeton, N. J.
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.
V & O Press Co., Div. Emhart Mfg. Co.,
Hudson, N. Y.

PRESSES, Forging

Ajax Mfg. Co., Euclid, Cleveland 17, Ohlo. American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincin-Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Lima-Hamilton Div., Hamilton, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio. Berniehem Steel Co., Bethlehem, Pa.
Bliss Co., E. W., 1375 Raff Rd., S. W., Canton,
Ohio.
Clearing Machine Corp., 6499 W. 65th St.,
Chicago 38, III.
Cleveland Punch & Shear Works Co., 3917 St.
Clair Ave., N. E. Cleveland, Ohio.
Dake Engine Co., 604 Seventh St., Grand
Haven, Mich.
Parquhar Co., A. B., 21 Duke St., York, Pa.
Farquhar Co., A. B., 21 Duke St., York, Pa.
Ferracute Machine Co., Bridgeton, N. J.
Henry & Wright Div., Emhart Mfg. Co., 760,
Windsor St., Hartford 1, Conn.
Hydraulic Press Mfg. Co., 300 Lincoln Ave.,
Mt. Gilead, Ohio.
Hydropress, Inc., 350 Fifth Ave., New York 1,
N. Y.
Lake Erie Engrg. Corp., Kenmore Station, Buffolo, N. Y.
Morgan Engrg. Co., Alliance, Ohio.
National Mchry. Co., Greenfield and Stanton
Sts., Tiffin, Ohio.
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.
V & O Press Co., Div. Emhart Mfg. Co.,
Hudson, N. Y.
Verson Allsteel Press Co., 93rd St. and S. Kenwood Ave., Chicago, III.
Watson-Stillman Co., Aldene Rd., Roselle, N. J.
Wilson, K. R., 215 Moin St., Buffalo, N. Y.
Zeh & Hahnemann Co., 182 Vanderpool St.,
Newark, N. J.

PRESSES, Hydraulic

American Broach & Mch. Co., Ann Arbor, Mich. American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.

Anderson Bros. Mfg. Co., 1910 Kishwaukee St., Rockford, Ili.

Baldwin-Lima-Hamilton Corp., Lima-Hamilton Div., Hamilton, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Birdsboro Steel Fdry. & Mch. Co., Birdsboro, Pa.
Bilss Co., E. W., 1375 Raff Rd., S. W. Canton, Ohio.

Chambersburg Engra. Co., Chambersburg, Pa. Ohio.
Clambersburg Engrg. Co., Chambersburg, Pa. Clearing Machine Corp., 6499 W. 65th St., Chicago 38, Ill.
Colonial Broach Co., P. O. Box 37, Harper Sta., Detroit, Mich.
Columbia Mchry. & Engrg. Co., Hamilton 1, Ohio.
Dake Engine Co., 604 Seventh St., Grand Haven, Mich.
Denison Engrg. Co., 1160 Dublin St., Columbus 16, Ohio.
Farquihar Co., A. B., 21 Duke St., York, Pa. Farrel-Birmingham Co., Inc., 25 Main St., Annonia, Com.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill. Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, III.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Hydropress, Inc., 350 Fifth Ave., New York 1, N.Y.
Lake Erie Engrg. Corp., Kenmore Station, Buffolo, N.Y.
Lapointe Machine Tool Co., 34 Tower St., Hudson, Mass.
Morgan Engrg. Co., Alliance, Ohio.
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N.Y.
Turner Bros., Inc., 2625 Hilton Rd., Ferndale 20, Mich.
Verson Allsteel Press Co., 93rd St. and S. Kenwod Ave., Chicago, III.
Watson-Stillman Co., Aldene Rd., Roselle, N. J.
Wilson, K. R., 215 Main St., Buffalo, N.Y.

PRESSES, Pneumatic

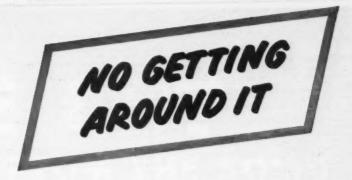
Mead Specialties Co., 4114 North Knox Ave., Chicago 41, Ill.

PRESSES, Screw

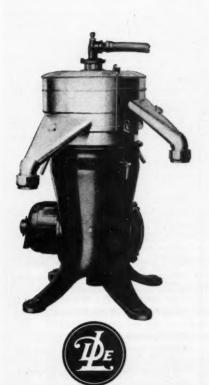
Bliss Co., E. W., 1375 Raff Rd., S. W. Canton, Ohio.
Dake Engine Co., 604 Seventh St., Grand Haven, Mich. (Continued on page 364)







DE LAVAL OIL PURIFIERS STOP TROUBLE BEFORE IT STARTS



Water and dirt can do a lot of damage to presses and other hydraulically-operated mechanisms. Condensate in hydraulic oils can rust pumps, valves and controls, causing leather seals to harden. Dirt is equally bad, for it can score highly finished surfaces and make costly repairs necessary.

De Laval Oil Purifiers save hydraulic mechanisms in presses and other machines by providing a continuous supply of clean and dry oil, that can be used indefinitely with perfect safety.

Hydraulic oil is but one of many types of factory oil that can be maintained at its best by means of De Laval centrifugals. Cutting oil . . . washing oils . . . honing oils . . . lubricating oil . . . and many others should also be continuously purified. *Clean* oil prevents trouble!

THE DE LAVAL SEPARATOR COMPANY
Poughkeepsie, New York 427 Randolph St., Chicago 6
DE LAVAL PACIFIC CO., 61 Beale St., San Francisco 5
THE DE LAVAL COMPANY, Limited, Peterborough, Ont.

DE LAVAL PURIFIERS AND CLARIFIERS
FOR FACTORY OILS

Ferracute Machine Co., Bridgeton, N. J. Niagara Machine & Tool Works, 683 North-land Ave., Buffalo, N. Y. Zeh & Hahnemann Co., 182 Vanderpool St., Newark, N. J.

PRESSES, Sheet Metal Working

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincin-

Paddack Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Lima-Hamilton Div., Hamilton, Ohio.
Bath, Cyril, Co., 6984 Machinery Ave., Cleveland 3, Ohio.
Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Chambersburg Engrg. Co., Chambersburg, Pa. Cincinnati Shaper Co., Elam and Garrard Ave., Cincinnati, Ohio.
Clearing Machine Corp., 6499 W. 65th St., Chicago 38, Ill.
Cleveland Crane & Engrg. Co., Wickliffe, Ohio.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Columbia Machinery & Engineering Corp., Hamilton 1, Ohio.

Consolidated Mch. Tool Corp., Rochester, N. Y. Dake Engine Co., 604 Seventh St., Grand Haven, Mich.
Danly Machine Specialties, Inc., 2107 S. 52nd
Ave., Chicago 50, III.
Dreis & Krump Mfg. Co., 7416 Loomis Blvd.,
Chicago 36, III.
Espen-Lucas Machine Warks, Front St. and
Girard Ave., Philadelphia, Pa.
Famco Machine Co., 3134 Sheridan Rd.,
Kenosha, Wis.
Farquhar Co., A. B., 21 Duke St., York, Pa.
Ferrocute Machine Co., Bridgeton, N. J.
Henry & Wright Div., Emhart Mfg. Co., 760
Windsor St., Hartford 1, Conn.
Hydraulic Press Mfg. Co., 300 Lincoln Ave.,
Mt. Gilead, Ohio.
Hydropress, Inc., 350 Fifth Ave., New York 1,
N. Y.
Johnson Mch. & Press Corp., 620 W. Indiana
Ave., Elkhart, Ind.
Loke Erie Engrg. Carp., Kenmare Station, Buffolo, N. Y.
& J Press Corp., Elkhart, Ind.
Minster Machine Co., Minster, Ohio.
Niagara Machine Co., Minster, Ohio.
Niagara Machine Co., Minster, Ohio.
Niagara Machine Co., Minster, Ohio.

Sales Service Mch. Tool Co., 2363 University Ave., St. Paul, Minn. Verson Allsteel Press Co., 93rd St. and S. Ken-wood Ave., Chicago, III. V & O Press Co., Div. Emhart Mfg. Co., Hudson, N. Y. Wales-Strippit Corp., North Tonawanda, N. Y. Watson-Stillman Co., Aldene Rd., Roselle, N. J. Wilson, K. R., 215 Main St., Buffalo, N. Y. Zeh & Hahnemann Co., 182 Vanderpool St., Newark, N. J.

PRESSES, Straightening

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincin-

noti, Ohio.
Anderson Bros. Mfg. Co., 1910 Kishwaukee St., Rockford, III.
Baidwin-Lirna-Hamilton Corp., Lima-Hamilton Div., Hamilton, Ohio.
Chambersburg Engra. Co., Chambersburg, Pa.
Colonial Broach Co., P. O. Box 37, Harper Sta., Detroit, Mich.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Dake Engine Co., 604 Seventh St., Grand Haven, Mich.
Farquhar Co., A. B., 21 Duke St., York, Pa.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, III.

III.
Hufford Machine Works, Inc., 1700 E. Grand
Ave., El Segundo, Calif.
Hydraulic Press Mfg. Co., 300 Lincoln Ave.,
Mt. Gilead, Ohio.
Hydropress, Inc., 350 Fifth Ave., New York 1,
N. Y.

N. Y.
Morgan Engra. Co., Alliance, Ohio.
Niagara Mch. & Tool Works (Hydraulic), 683
Northland Ave., Buffalo, N. Y.
Springfield Mch. Tool Co., Springfield, Ohio.
Watson-Stillman Co., Aldene Rd., Roselle, N. J.
Wilson, K. R., 215 Main St., Buffalo, N. Y.

PROFILING MACHINES

Consolidated Mch. Tool Corp., Rochester, N. Y. Cosa Corp., 405 Lexington Ave., New York 17, N. Y. N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit
32, Mich.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Gorton, George, Machine Co., 1110 W. 13th St.,
Racine, Wis. Racine, Wis.

Morey Mchry. Co., Inc., (and Affiliated companies), 410 Broome St., New York, N. Y.
Onsrud Machine Works, Inc., 3940 Palmer St.,
Chicago, Ill.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

PULLEYS

Boston Gear Works, 3200 Main St., North Quincy 71, Mass. Pull-Gear Co., 21125 Dequindre St., Hazel Park, Mich.

PULLEYS, Friction Clutch

Brown & Sharpe Mfg. Co., Providence, R. I.

PUMPS, Coolant, Lubricant and Oil

PUMPS, Coolant, Lubricant and Oil
Bowser, Inc., 1365 E. Creighton Ave., Fort
Wayne, Ind.
Brown & Sharpe Mfg. Co., Providence, R. I.
Delta Power Tool Div., Rockwell Mfg. Co., 620
E. Vienna Ave., Milwaukee, Wis.
Ingersoll-Rand Co., Phillipsburg, N. J.
Logansport Machine Co., Inc., Logansport, Ind.
Pioneer Pump & Mfg. Co., 19679 John R St.,
Detroit, Mich.
Ruthman Machinery Co., 1809 Reading Rd.,
Cincinnati 12, Ohio.
Tomkins-Johnson Co., Jackson, Mich.
Tuthill Pump Co., 939 E. 95th St., Chicago 19,
Ill. Viking Pump Co., Cedar Falls, Iowa.

PUMPS, Hydraulic

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincin-nati, Ohio. Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.

Barnes, John S., Corp., Rockford, III.

Bethlehem Steel Co., Bethlehem, Pa.

Brown & Sharpe Mfg. Co., Providence, R. I.

Chambersburg, Engrg. Co., Chambersburg, Pa.

Denison Engrg. Co., 1160 Dublin St., Columbus

16, Ohio.

Gerotor May Corp., Oliver St. and Maryland

Ave., Baltimore, Md.

Hydraulic Press Mfg. Co., 300 Lincoln Ave.,

Mt. Gilead, Ohio.

Hydropess, Inc., 350 Fifth Ave., New York 1,

N. Y.

Ingersoil-Rand Co., Phillianthyre, M. I. Ingersoll-Rand Co., Phillipsburg, N. J. (Continued on page 366)

When You Need Pump Replacements...

Let this TUTHILL PUMP **GUIDE Save You Time** and Trouble.....

To help you select the right pump for your replacements, Tuthill offers this handy, letterhead-size reference chart. It shows the Tuthill pumps available for each type of service, complete with capacities, pressures, speeds, packing, mounting and exclusive performance features. It makes the job of picking the right pump easier than ever before. It saves you time, work and trouble.

Write for your Tuthill Pump Guide today!

TUTHILL PUMP COMPANY 939 East 95th Street, Chicago 19, Illinois

ONE CUT

FROM THE SOLID

16 D. P. and Finer

- Gleason No. 2 Straight Bevel Generator
- Complete Precision Gears in one Operation
 - Features Interlocking Multi-blade CONIFLEX® Cutters
- Easily Set-up for Job Lot Quantities
- Can Be Equipped with Automatic Loader
- Cuts CONIFLEX®Gears . . . Localized Tooth Bearing

GLEASON WORKS

BUILDERS OF BEVEL GEAR MACHINERY FOR OVER 85 YEARS

LEASO

JOHNSON

BEARINGS ARE PRECISION MADE



REGARDLESS of size, Johnson Sleeve Bearings are made to precise dimensions required by modern high speed, heavy duty machinery. The Johnson plant is equipped with complete facilities for producing sleeve bearings up to the largest practical size. They are available in cast bronze, cast bronze babbitt-lined, cast steel babbitt-lined, and aluminum alloy . . . with various bronze and aluminum alloys suitable to your service requirements. Johnson engineers will gladly confer with you on "King Size" bearings and assist in designing them to suit the application. Write for an appointment.

JOHNSON BRONZE CO. 520 South Mill St., New Castle, Pa.



No matter how large or small, there is a Johnson Sleeve Bearing to fit your requirements.

Lapointe Machine Tool Co., 34 Tower St., Hudson, Mass. Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill. Tuthill Pump Co., 939 E. 95th St., Chicago 19, Viking Pump Co., Cedar Falls, Iowa.

PUMPS, Pneumatic

Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y. Ingersoll-Rand Co., Phillipsburg, N. J.

PUMPS, Rotary

Bowser, Inc., 1365 E. Creighton Ave., Fort Wayne, Ind.
Brown & Sharpe Mfg. Co., Providence, R. I. Pioneer Pump & Mfg. Co., 19679 John R St., Detroit, Mich.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.
Tuthi Viking Pump Co., Cedar Falls, Iowa.

PUMPS, Vacuum

Leiman, Inc., 156 Christie St., Newark, N. J.

PUNCHES AND DIES

See Dies, Sheet Metal, Etc.

PUNCHES, Centering

Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.

PUNCHING MACHINERY

Bath, Cyril, Co., 6984 Machinery Ave., Cleveland 3, Ohio.
Buffalo Forge Co., 490 Broadway, Buffalo, land 3, Ohio.

Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.

Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.

Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.

Columbia Machinery & Engineering Corp., Hamilton 1, Ohio.

Consolidated Mch. Tool Corp., Rochester, N. Y.
Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.

Ferracute Machine Co., Bridgeton, N. J.

Hannifin Corp., 1101 S. Kilbourn Ave., Chlacago, Ill.

Kling Bros., Engineering Works, 1320 No. Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, III.
Kling Bros., Engineering Works, 1320 No.
Kostner Ave., Chicago 51, III.
Niagara Mch. & Tool Works, 683 Northland
Ave., Buffalo, N. Y.
O'Neil-Irwin Mfg. Co., Lake City, Minn.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th
5t., Chicago 18, III.
Wales-Strippit Corp., North Tonawanda, N. Y.
Watson-Stillman Co., Aldene Rd., Roselle, N. J.
Wiedemann Machine Co., 4272 Wissahickon
Ave., Philadelphia, Pa.

PYROMETERS

Bristol Co., Platts Mills, Waterbury, Conn.

RACKS, Gear Cut

RACKS, Geer Cut

Atlantic Gear Works, Inc., 200 Lafayette St.,
New York 12, N. Y.

Boston Gear Works, 3200 Main St., North
Quincy 71, Mass.

Brown & Sharpe Mfg. Co., Providence, R. I.
Gear Specialties, Inc., 2635 W. Medill Ave.,
Chicago 47, Ill.

Hartford Special Mchry. Co., 287 Homestead
St., Hartford, Conn.

Massachusetts Gear & Tool Co., 36 Nassau St.,
Woburn, Mass.

Ohio Gear Co., 1333 E. 179th St., Cleveland,
Ohio.

Philadelphia Gear Works, Inc., Erle Ave. and
G. St., Philadelphia, Pa.

Stahl Gear & Mch. Co., 3901 Hamilton Ave.,
Cleveland 14, Ohio.

REAMER HOLDERS

Lipe-Rollway Corp., 806 Emerson Ave., Syra-cuse, N. Y. McCrosky Tool Corp., 1938 Thomas St., Mead-ville, Pa. Warner & Swasey Co., 8701 Carnegle Ave., Cleveland 3, Ohio.

(Continued on page 368)







at 20 feet a minute

... or 500 pounds at 42 feet a minute

- This latest CP AIR HOIST with variable speed, rotary vane air motor — spots loads accurately, quickly; sets them down gently.
- New design, trouble-free throttle valve provides sensitive control from an almost imperceptible creep to full speed.
- Air motor cannot overheat no shock hazard no spark hazard — no switches to maintain.
- Self-locking worm gear provides automatic brake no brake bands to adjust or replace.
- Weighing only 57 pounds, the CP AIR HOIST can readily be carried by millwright to any location.
- Furnished in 300, 500, 700, and 1000 pound capacities.

Write for a copy of Bulletin SP-3027



PHEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES
ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES



AGAIN- Millers Falls

Drivers Solve One of the Most Exacting Assembly Jobs in Industry



High-speed nut-running on Lundey terminals — many production men would hesitate to attempt the job with a power driver.

Torque limits are hair fine. Too little, and connections loosen. Too much, and brittle ceramic insulators chip and crack.

Yet, Millers Falls versatile No. 50 Electric Screw Drivers are handling this difficult assignment quickly, cheaply, accurately for a leading electronics manufacturer. Thanks to the patented, "Adjustomatic" Clutch, these powerful drivers control torque with extreme precision - maintain exact setting month after

Velvet smooth and vibrationless, they have all the punch and endurance needed for continuous high speed production. Write for full information. Capacities for driving machine screws up to $\frac{3}{6}$, wood screws up to $\frac{21}{2}$ — with torque readily adjustable for any requirement from inch-ounces to foot-pounds.

MILLERS FALLS COMPANY, Greenfield, Massachusetts



WE HAVE YET TO SEE WE NAVE YET TO SEE
an assembly operation foodelicate for Militars Fails
"Adjustomatic." Clutch Series
Poivers. Lundey terminals are
typical — requiring supersensitive torque control to
prevent breakage. On all
sizon —right down to 1/18"
conductors with 1-72 NF-2
Threads — Militars Fails
Drivers are delivering outstanding performance.



REAMERS

Atrax Co., Newington, Conn. Barber-Colman Co., Rock and Montague, Rock-Barber-Colman Ce., Rock and Montague, Rockford, Ill.

Butterfield Div., Union Twist Drill Co., Derby Line, Vt.

Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.

Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.

Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.

Firth-Sterling Inc., McKeesport, Pa.

Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.

Detroit, Mich.

Detroit, Mich.

Corp., Greenfield, Mass.

Haynes Stellite Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.

Keo Cutter, 19326 Woodward, Detroit, Mich. Carbon Corp., 30, E. 42nd St., New York, N. Y.
Keo Cutter, 19326 Woodward, Detroit, Mich.
Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Morse Twist Drill & Mch. Co., New Bedford,
Mass.
National Twist Drill & Tool Co., & Winter Bros.
Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Super Tool Co., 21650 Hoover, Rd., Detroit 13,
Mich.
Union Twist Drill Co., Athol, Mass.
Willey's Carbide Tool Co., 1340 W. Vernor
Hwy., Detroit 1, Mich.

REAMERS, Adjustable

Barber-Colman Co., Rock and Montague, Rock-Barber-Colman Co., Rock and Montague, Rockford, III.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich. Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Firth-Sterling Inc., McKeesport, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Greenfield Tap & Die Corp., Greenfield, Moss. Madison Mg. Co., Muskegon Heights, Mich. McCrosky Tool Corp., 1938 Thomas St., Meadwille, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney, West Hartford 1, Conn. Mass.
Pratt & Whitney, West Hartford 1, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Union Twist Drill Co., Athol, Mass.
Wesson Co., 1220 Woodward Heights Blvd.,
Ferndale, Mich.

REAMERS, Toper Pin

REAMERS, Taper Pin

Butterfield Div., Union Twist Drill Co., Derby
Line, Vt.
Gorham Tool Co., 14400 Woodrow Wilson,
Detroit, Mich.
Greenfield Tap & Die Corp., Greenfield, Mass.
Kaufman Manufacturing Co., Manitowoc, Wis.
Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.

Morse Twist Drill & Mch. Co., New Bedford,
Mass.
National Twist Drill & Tool Co., & Winter Bros.
Co., Rochester, Mich.
Pratt & Whitney, West Hartford I, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Union Twist Drill Co., Athol, Mass.

REAMING MACHINES

Greaves Machine Tool Co., 2009 Eastern Ave., Cincinnati, Ohio.
Kaufman Manufacturing Co., Manitowoc, Wis. Morris Machine Tool Co., 9 Harriet St., Cincinnati 3, Ohio.
Pratt & Whitney, West Hartford 1, Conn.
Van Norman Co., 3640 Main St., Springfield 7, Mass.

RECORDING INSTRUMENTS for Counting

National Acme Co., 170 E. 131st St., Cleveland, Ohio.

RECORDING INSTRUMENTS for Electricity

Bristol Co., Platts Mills, Waterbury, Conn. General Electric Co., Schenectady, N. Y.

RECORDING INSTRUMENTS for Pressure

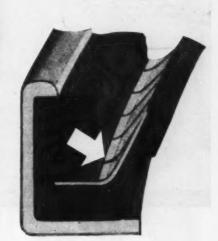
Bristol Co., Platts Mills, Waterbury, Conn. (Continued on page 370)

GARLOCK Klozure Dil Seals

or GARTER SPRINGS FOR EVERY BEARING APPLICATION

Right: FINGER SPRING

The finger spring, perfected by Garlock, is very flexible. Each finger delivers independently a light yet active pressure to the lip of the sealing member. The result is a constant and responsive shaft-contact around the entire periphery of the sealing lip.



Below: GARTER SPRING

The conventional type spring used in many types of oil seals. This spring is available in several KLOZURE models in which are also incorporated the same accurately molded synthetic rubber sealing member and precision-formed metal case that are used in all Garlock KLOZURE models.



USE GARLOCK KLOZURES

There's a service-tested Klozure model with your choice of spring for every bearing application. These superior oil seals are produced in a wide range of sizes including Metric to fit standard International millimeter ball and roller bearing housings. Prolong the life of your bearings—protect them with Garlock Klozure Oil Seals.

Write today for Klozure Catalog No. 10.

THE GARLOCK PACKING COMPANY PALMYRA, NEW YORK

In Canada: The Garlock Packing Company of Canada Ltd., Toronto, Ont.



GARLOCK

PACKINGS, GASKETS, OIL SEALS,
MECHANICAL SEALS,
RUBBER EXPANSION JOINTS



TAPPING ATTACHMENTS
TAPS · FLEXIBLE SHAFTS
AND MACHINES
ROTARY FILES
TUNGSTEN CARBIDE
REAMERS AND MILLS
DRILLS · BORING BITS



Whether your operations call for GRINDING, CUTTING, BUFFING, or ROTARY FILING, Jarvis Flexible Shaft Machines will do your jobs Easier—Faster and more economically.

Available in Bench, Floor or Overhead types — in Single or Multiple Speeds to suit your individual requirements.

Jarvis Factory trained representatives are ready to assist you select the Machines you need. For further information and Catalog of Jarvis Flexible Shaft Machines, write directly to The Charles L. Jarvis Company, Middletown, Connecticut.

THE CHARLES L. JARVIS CO. MIDDLETOWN IN CONNECTICUT

RECORDING INSTRUMENTS for Speed Bristol Co., Platts Mills, Waterbury, Conn.

RECORDING INSTRUMENTS for Temperature

Bristol Co., Platts Mills, Waterbury, Conn.

REELS, Stock, Standard and Automatic

Nilson, A. H., Mch. Co., 1506 Railroad Ave., Bridgeport, Conn. U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

REFRACTORIES, Heat-Treating Furnace

Norton Co., 1 New Bond St., Worcester 6, Moss.

REGULATORS, Temperature

Bristol Co., Platts Mills, Waterbury, Conn. General Electric Co., Schenectady, N. Y.

REMOVERS, Japan, Enamel, Etc.

Oakite Products, Inc., 19 Rector St., New York, N. Y.

RETAINING RINGS FOR BEARINGS, Etc.

Nice Ball Bearing Co., Nicetown, Philadelphia, Pa.. Waldes-Kohinoor, Inc., 4716 Austel Place, Long Island City 1, N. Y.

RHEOSTATS

Allen-Bradley Co., 1326 S. 2nd St., Milwaukee, Wis. General Electric Co., Schenectady, N. Y.

RIVET SETS

Bethlehem Steel Co., Bethlehem, Pa. Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.

RIVETERS, Hydraulic

Bethlehem Steel Co., Bethlehem, Pa. Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y. Hanna Engineering Works, 1752 Elston Ave., Chicago, Ill. Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill. Morgan Engra. Co., Alliance, Ohio.

RIVETERS, Pneumotic

Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Grant Mfg. & Machine Co., 90 Silliman St., Bridgeport 5, Conn.
Hanna Engineering Works, 1752 Elsten Ave., Chicago, III.
Ingersoil-Rand Co., Phillipsburg, N. J.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, III.

RIVETING MACHINES

Buffalo Forge Co., 490 Broadway, Buffalo, N. Y. Grant Mfg. & Machine Co., 90 Silliman St., Bridgeport 5, Conn. Hanna Engineering Works, 1752 Elston Ave., Chicago, Ill. Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill. Snyder Tool & Engineering Co., 3400 E. Lafayette, Detroit 7, Mich. Tomkins-Johnson Co., Jackson, Mich.

RIVET MAKING MACHINES

Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio. National Machinery Co., Greenfield and Stanton Sts., Tiffin, Ohio.

RUBBER PRODUCTS

Garlock Packing Co., Palmyra, N. Y.

RULES, Steel

Brown & Sharpe Mfg. Co., Providence, R. I. Millers Falls Co., Greenfield, Mass. Scherr, George, Ca., Inc., 200 Lafayette St., New York 12, N. Y. Starrett, The L. S., Co., Athol, Mass.

RUST PREVENTIVES

Houghton, E. F., & Co., 303 W. Lehigh Ave., Philiadelphia, Pa. Oakite Products, Inc., 19 Rector St., New York, N. Y. Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

SAND BLAST EQUIPMENT

See Blast Cleaning Equipment.

SANDERS

Black & Decker Mfg. Co., E. Penna. Ave., Towson, Md.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa. Ingersoll-Rand Co., Phillipsburg, N. J. Jarvis, Charles L., Co., Middletown, Conn. Millers Falls Co., Greenfield, Mass.
Porter-Cable Machine Co., Salina St., Syracuse, N. Y.
Skil Corp., 5039 Eiston Ave., Chicago, Ill. Skil Corp., 5039 Elston Ave., Chicago, III. Sundstrand Machine Tool Co., 2531 11th St., Rockford, III.

SAW BLADES, Hack

Armstrong-Blum Mfg. Co., 5700 W. Blooming-dale Ave., Chicago, Ill.
Atkins, E. C., & Co., 402 South Illinois St., Indianapolis 9, Ind.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Millers Falls Co., Greenfield, Mass.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Starretf, The L. S., Co., Athol, Mass.
Victor Saw Works, Inc., Middletown, N. Y.

SAW SHARPENING MACHINES

Earle Gear & Machine Co., 4707 Stenton Ave., Wayne Junction, Philadelphia 44, Pa. Espen-Lucas Machine Works, Front St. and Girard Ave., Philadelphia, Pa. Motch & Merryweather Mchry. Co., Penton Bidg., Cleveland, Ohio. Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

SAWING MACHINES, Circular

Consolidated Mch. Tool Corp., Rochester, N. Y. Cosa Corp., 405 Lexington Ave., New York 17, N. Y. Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa. DoAll Co., 254 Laurel Ave., Des Plaines, III. Earle Gear & Machine Co., 4707 Stenton Ave., Wayne Junction, Philadelphia 44, Pa. Espen-Lucas Machine Works, Front St. and Girard Ave., Philadelphia, Pa. Motch & Merryweather Mchry. Co., Penton Bldg., Cleveland, Ohio. Triplex Machine Tool Co., 125 Barclay St., New York, N. Y.

SAWING MACHINES, Friction

DoAll Co., 254 Laurel Ave., Des Plaines, III. Kling Bros., Engineering Works, 1320 No. Kostner Ave., Chicago 51, III. Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, III.

SAWING MACHINES, Metal Cutting

Armstrong-Blum Mfg. Co., 5700 W. Blooming-dale Ave., Chicago, III.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
DoAll Co., 254 Laurel Ave., Des Plaines, III.
Famco Machine Co., 3134 Sheridan Rd.,
Kenosha, Wis.
Grob Bros., Grafton, Wis.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th
St., Chicago 18, III.
Simonds Saw & Steel Co., 470 Main St., Fitch-burg, Mass.
Tannewitz Works, 315 N. W. Front, Grand
Rapids, Mich.
Walker-Turner Div., Kearney & Trecker Corp.,
South Ave., Plainfield, N. J.
(Constituted on tage 372)

(Continued on page 372)



Quality

ROTARY FILES • REAMERS • BORING BITS • END MILLS

TAPS TORQOMATICS MULTI-TAPPERS FLEXIBLE SHAFT MACHINES

WRITE FOR ILLUSTRATED CATALOG



MACHINERY, November, 1952-371



Economy is one of the many advantages that make Contour Forming an important factor in the construction of aircraft, jet engines, guided missiles, railroad coaches, trucks, buses, etc. Single or compound curves, true, full circles or segments, shallow bends or short radius curves can be formed in most metals, including 95% titanium. Many manufacturers have profited by using our highly experienced Forming Division as an extension of their own production facilities. Send us a print and quantity requirements of some of your needed parts and we will quote on them.

> Our new 32-page catalog CF-352 is just off the press and your capy is waiting for you. Send for it.





COMPANY

6955 Machinery Ave.

Cleveland 3, Ohio

SAWING MACHINES, Power Hock

Armstrong-Blum Mfg. Co., 5700 W. Blooming-dale Ave., Chicago, Ill.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Victor Saw Works, Inc., Middletown, N. Y.

SAWS, Circular Metal Cutting

SAWS, Circular Metal Cutting

Atkins, E. C., & Co., 402 South Illinois St., Indianapolis 9, Ind.

Brown & Sharpe Mfg. Co., Providence, R. i. Consolidated Mch. Tool Corp., Rochester, N. Y. DoAll Co., 254 Laurel Ave., Des Plaines, Ill. Espen-Lucas Machine Works, Front St. and Girard Ave., Philadelphia, Pa. Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich. Motch & Merryweather Mchry, Co., Penton Bidg., Cleveland, Ohio.

National Twist Drill & Tool Co., & Winter Bros. Co., Rochester, Mich.

Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.

Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.

Union Twist Drill Co., Athol, Mass.

Walker-Turner Div., Kearney & Trecker Corp., South Ave., Plaintield, N. J.

SAWS, Metal Cutting Band

Armstrong-Blum Mfg. Co., 5700 W. Blooming-dole Ave., Chicago, III.
Atkins, E. C., & Co., 402 South Illinois St., Indianapoiis 9, Ind.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittaburgh 8, Pa.
DoAll Co., 254 Laurel Ave., Des Plaines, III.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th
St., Chicago 18, III.
Simonds Saw & Steel Co., 470 Main St., Fitch-burg, Mass.
Starrett, The L. S., Co., Athol, Mass.
Valker-Turner Div., Kearney & Trecker Corp., South Ave., Plainfield, N. J.

SAWS, Portable Electric

Black & Decker Mfg. Co., E. Penna Ave., Towson, Md. Millers Falls Co., Greenfield, Mass. Skil Corp., 5039 Eiston Ave., Chicago, Ill.

SAWS, Screw Slotting

Barber-Colman Co., Rock and Montague, Rock-Form & Sharpe Mfg. Co., Providence, R. I. Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich. Morse Twist Drill & Mch. Co., New Bedford, Detroit, Mich.
Morse Twist Drill & Mch. Co., New Bedford,
Mass.
National Twist Drill & Tool Co., & Winter Bros.
Co., Rochester, Mich.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Starrett, The L. S., Co., Athol, Mass.
Union Twist Drill Co., Athol, Mass.

SCRAPERS, Hand and Power

Anderson Bros. Mfg. Co., 1910 Kishwaukee St., Rockford, III.

SCREW DRIVERS, Power

Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y. Ingersoll-Rand Co., Phillipsburg, N. J.

SCREW DRIVING AND NUT SETTING EQUIPMENT

Black & Decker Mfg. Co., E. Penna Ave., Towson, Md. Errington Mechanical Laboratory, Inc., 24 Nor-wood Ave., Stapleton, S. I., N. Y. Ingersoll-Rand Co., Phillipsburg, N. J. Jarvis, Charles L., Co., Middletown, Conn.

SCREW MACHINE TOOLS AND EQUIPMENT

Bardons & Oliver, Inc., Ft. W. 9th St., Cleve-land 13, Ohio. Brown & Sharpe Mfg. Co., Providence, R. I. Cleveland Automatic Machine Co., 4932 Beech St., Cincinnati 12, Ohio. Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.

(Continued on page 376)



THE IMPROVED 6-SPINDLE PRECISION

AUTOMATIC LATHE

VERSATILE—SIX rotating end tools and SIX cross tool slides. ECONOMICAL-Both in tooling and set-up expense; uses comparatively little floor space.

EFFICIENT-High production, with built-in precision to meet exacting standards.

UNIQUE DESIGN-Vertical arrangement reduces wear of moving parts. Gravity bar feed requires no feed fingers, reduces load on spindles, minimizes vibration and noise.

CHUCKING OPERATIONS

... can also be performed to great advantage. Vertical design permits easier loading and holding of work pieces.



GYROMATIC SIX-SPINDLE VERTICAL LATHE

(Shown without bar carrier and all guards)

Typical work piece taken from bars; capacity to 258 dia. and 6 long.



AMERICAN REPRESENTATIVES (UNITED STATES-EXCEPT WEST COAST)

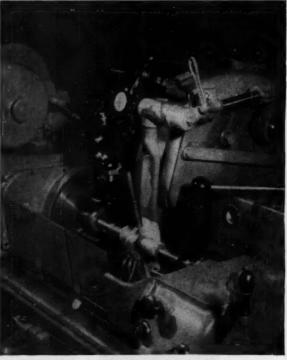
292 MADISON AVENUE, NEW YORK 17, N. Y.

(CALIFORNIA, OREGON, WASHINGTON)

2820 LEONIS BLVD., LOS ANGELES, CALIF.



SURFACE GRINDING. For fast, cool cutting action Norton wheels, cylinders and segments are unbeatable. 32 or 38 ALUNDUM abrasive for hardened steels and CRYSTOLON abrasive for gray iron and non-ferrous metals.



O.D. GRINDING. Norton O.D. wheels in the abrasives, grain sizes and bonds for best results on every material are sure protection for big grinding machine investments.

NORTON BRINGS YOU

More types of abrasive products... for More savings...on More jobs

You'll find the right answers to every one of your grinding problems in the Norton line of abrasive products. First, because it is the world's most complete line — offering you more choices than any other. Second, because Norton Research — which has chalked up an impressive list of "firsts" in abrasive development and Norton's endless field testing — make sure that every Norton abrasive product will deliver top performance on the work it is designed for.

That's the combination of variety and efficiency that will cut time, labor and costs on every grinding job you do.

SEE YOUR NORTON DISTRIBUTOR

for practical help in any grinding application. He knows Norton products — what they will do and what they won't do — and you'll find that his aid in selecting the right ones for your jobs is a real short cut to better, lower cost grinding . . . NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities. Export: Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass.

*Trade-Marks Reg. U.S. Pat. Off. and Foreign Countries



Making better products to make other products better TOOL AND CUTTER GRINDING. Norton New-Process wheels have no equal for uniformity, identical wheel performance and long even wheel wear. 32 ALUNDUM* abrasive for carbon and alloy steel, CRYS-TOLON* abrasive for cemented carbides.



POLISHING AND LAPPING. ALUNDUM grain comes in surface treatments and grain sizes for best results on every polishing job. And precise sizing makes ALUNDUM and CRYSTOLON abrasives favorites for even the fussiest lapping jobs.

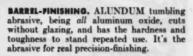


ROUGH GRINDING. On swing frames, floor stands or portable grinders, Norton wheels "hug that work," to cut time and costs. And Norton Reinforced Hub Wheels are the safest, most versatile ever made.

WHITE AND STORES



Each one is trued on its own spindle to eliminate "breaking in" and to insure its running absolutely true.





DISC GRINDING. Norton ALUNDUM and CRYSTOLON discs boost production and reduce down-time. They leave flat surfaces straight and smooth, with no excess heat to cause warpage.



INTERNAL GRINDING. Being identical in grinding action, Norton New-Process wheels can be changed without machine adjustments. That and uniform top performance make them valuable production boosters.



CUTTING-OFF. For wet or dry applications, high or low speeds, on any material, there's a Norton wheel in ALUNDUM or CRYSTO-LON abrasive that's "made to order" for fast, economical cutting off.

Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Greenlee Bros. & Co., 12th and Columbia Aves., Rockford, III.
Millers Falls Co., Greenfield, Mass.
National Acme Co., 170 E. 131st 5t., Cleveland, Ohio.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Corn.
Potter & Johnston Co., 1027 Newport Ave., Powthucket, R. I.
R and L Tools, 1825 Bristol St., Philadelphia 40, Pa.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

SCREW MACHINE WORK

Aluminum Co. of America, Oliver Bidg., Pitts-burgh, Pa.
Cleveland Automatic Machine Co., 4932 Beech 5t., Cincinnati 12, Ohio.
Eastern Mch. Screw Corp., New Haven, Conn. Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.

Never before

FOOT OR AIR OPERATED

Ottemiller, W. H., Co., York, Pa. Standard Pressed Steel Co., Jenkintown, Pa. Wicaco Machine Corp., Stenton Ave. and Louden St., Philadelphia, Pa.

SCREW MACHINES, Automatic Single and Multiple Spindle

Brown & Sharpe Mfg. Co., Providence, R. I. Cleveland Automatic Machine Co., 4932 Beech St., Cincinnati 12, Ohio., Cone Automatic Mch. Co., Inc., Windser, Vt. Cosa Corp., 405 Lexington Ave., New York 17, N. Y.

N. Y.
Gorton, George, Mch. Co., 1110 W. 13th St.,
Racine, Wis.
Greenlee Bros. & Co., 12th and Columbia
Aves., Rockford, III.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
National Acme Co., 170 E. 131st St., Cleveland
Chio.

New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn. Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.

A TAPPING MACHINE WITH

ALL THESE ADVANTAGES

Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y. Triplex Machine Tool Corp., 125 Barclay St., New York, N. Yool Corp., 125 Barclay St., Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

SCREW MACHINES, Hond

See also Lathes, Turret.

Bardons & Oliver, Inc., Ft. W. 9th St., Cleve-land 13, Ohio.
Brown & Sharpe Mfg. Ce., Providence, R. I. Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis. Hardinge Bros., Inc., 1418 Callege Ave., Elmira, N. Y. N. Y.
Orban, Kurt, Co., Inc., 205 East 42nd St.,
New York 17, N. Y.
Rivett Lathe & Grinder, Inc., Brighton, Boston
35, Mass.
Simmons Mch. Tool Corp., 1600 N. Broadway,
Albany, N. Y.
Warner & Swasey Co., 5701 Carnegie Ave.,
Cleveland 3, Ohio.

SCREW PLATES

Butterfield Div., Union Twist Drill Co., Derby Line, Vt. Cord, S. W., Mfg. Co., Div. Union Twist Drill Co., Mansfield, Mass. Greenfield Tap & Die Corp., Greenfield, Mass. Marse Twist Drill & Mch. Co., New Bedford, Moss.

Moss.

Moss.

Pratt & Whitney, West Hartford 1, Conn.

Threadwell Top & Die Co., 16 Arch St., Greenfield, Mass.

Winter Bros. Co., Rochester, Mich.

SCREWS, Cap, Set, Safety Set and Machine, Etc.

Allen Mfg. Co., 133 Sheldon St., Hartford 2, Conn. Allied Products Corp., 12677 Burt Rd., Detroit Allied Products Corp., 12677 Burt Rd., Detroit 23, Mich.
Bristol Co., Platts Mills, Waterbury, Conn.
Chicago Screw Co., Bellwood, Ill.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Ottemiller, W. H., Co., York, Pa.
Parker-Kolon Corp., 200 Varick St., New York 14, N.Y.
Republic Steel Corp., Bolt & Nut Div., Republic Bldg., Cleveland 1, Ohio.
Russell, Burdsall & Ward Bolt & Nut Co., 100 Midland Ave., Port Chester, N.Y.
Standard Pressed Steel Co., Jenkintown, Pa.

SCREWS, Self-Tapping Drive

Parker-Kalon Corp., 200 Varick St., New York 14, N. Y.

SCREWS, Thumb

Northwestern Tool & Engrg. Co., 117 Hollier Dayton, Ohio. Parker-Kalan Corp., 200 Varick St., New York 14, N. Y. Russell, Burdsall & Ward Bolt & Nut Co., 100 Midland Ave., Port Chester, N. Y. Williams, J. H., & Co., 400 Vulcan St., Buffolo 7, N. Y.

SEALS AND RETAINERS, Oil or Greese

Crane Packing Co., 1800 Cuyler Ave., Chicago. Garlock Packing Co., Palmyra, N. Y.
Gits Bros. Mfg. Co., 1846-62 Kilbourn Ave.,
Chicago, III.

SECOND-HAND MACHINERY, Etc.

Eastern Machinery Co., 1006 Tennessee Ave., Cincinnati 22, Ohio. Miles Machinery Co., Box 770, Saginaw, Mich. Morey Mchry. Co., Inc., 410 Broome St., New York, N. Y. Simmons Mch. Tool Corp., 1600 N. Broadway, Albany, N. Y.

SEPARATORS, Centrifuge!

De Laval Separator Co., Poughkeepsie, N. Y.

SEPARATORS, Oil or Coolant

Barnes Drill Co. (Magnetic), 814 Chestnut, Rockford, III. National Acme Co., 170 E. 131st St., Cleveland, Ohio. (Continued on page 378)

72A TAPPING MACHINE Here is a fast, versatile foot or air operaated tapping machine that puts high production precision tapping within easy reach of all manufacturers. Here's what · VERSATILITY. Interchangeable single spindle tapping units and multiple heads permit fast changeovers from job to job. e HIGH SPEED. Foot or air pressure does the work with a minimum of effort. Both hands are free to handle the part being tapped. • ECONOMY. Low initial cost and high production rates add up to big savings. . BUILT-IN SENSITIVITY. No skill or delicate touch is needed - it's ideal for unskilled • ADAPTABILITY. There's a lubrication setup for any tapping - gravity feed for minimum tap lubrication — a pumped oil bath for continufor details, ask your distributor ous flow. for Bulletin #72A. ETTCO TOOL CO., INC. 594 Johnson Ave. - Brooklyn 6, N.Y

FRF to every engineer with an industrial transfer to every engineer with an industrial transfer transfer to every engineer with an industrial transfer transfer to every engineer with an industrial transfer transfer transfer to every engineer with an industrial transfer tra

This encyclopedia of retaining rings combines—in one 52 page volume—engineering specifications and data for 17 different ring types—more than 600 different sizes. Gives assembly data, typical applications, everything you need to know about selection and use of Waldes Truarc Retaining Rings.

28 pages of charts giving complete angineering data and seclifications. Dimensions of Rings, Grooves, Shafts, and Housings Clearances, Allowable Thrust Loads; Safety RPM Limits. Data on end-play take-up. Countless other engineering data, arranged in easy-to-read, easy-to-use table form.



6 pages showing typical cost-cutting applications and case histories, covering self-locking rings; basic type rings; rings for taking up end-play; rings for radial assembly; and special rings.

5 pages showing drawings of assembly and accessory tools, designed to handle Truarc retaining rings on a speedy, production line basis. There are data an tools for recessing grooves, pllers and applicators for assembly, and the new Truarc "E"-ring dispenser.

You will find the new Waldes Truarc Retaining Ring Catalog invaluable in selecting and specifying Truarc retaining rings, the better way to hold parts tagether.





TRUARC

RETAINING RINGS

WALDES KOHINOOR, INC., LONG ISLAND CITY 1. NEW YORK WALDES TRUARC RETAINING RINGS AND PLIERS ARE PROTECTED BY ONE OR MORE OF THE POLLOWING U.S. PATERYS: 2.392.347; 2.392.340; 2.392.341; 2.420.321; 2.430.321; 2.430.313; 2.430.321 and other patery E-483.300; 1.403.331; 2.443.302; 2.443.302; 2.443.303; 2.453.301 and other paterys Persing.

MAIL THIS
TODAY FOR
TOUR COPY

Waldes Kohinoor, Inc., 47-16 Austel Place, L. 1. C.
1, N. Y.

Please send the new complete Waldes Truarc Retaining
Ring Catalog.

(PLEASE PRINT)

Name
Title
Company

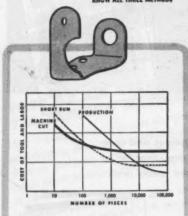
City. Zone State



Our Impartial use of three basic methods gives you economy re-gardless of length of run.

Most parts can be made by all three methods. But only one is most economical. The right decision is a technical one, based on over-all quantity, contour dimensions, tolerances and materials.

> YOUR SUPPLIER SHOULD KNOW ALL THREE METHODS



This logarithmic chart shows the effect of these factors on the specific pert illustrated. From 1 to 150 parts, our own Machine-Cut Method with no die cost whatsoever is most economical. At 150 parts, the Short-Run Method using economical blanking dies and stock punches is best. At 10,000 units, the standard Production Method with standard dies is most satisfactory.

For more information, use coupon on opposite page

STAMPINGS DIVISION



3911 Union Street, Glenbrook, Conn.

SHAFTING, Steel

Bethlehem Steel Co., Bethlehem, Pa.
Cumberland Steel Co., Cumberland, Md.
De Laval Separator Co., Poughkeepsle, N, Y.
LaSalle Steel Co., Hammond, Ind.
Republic Steel Corp., Union Drawn Steel Div.,
Republic Bldg., Cleveland I, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St.,
Chicago 18, Ill.
Solar Steel Corp., Union Commerce Bldg.,
Cleveland, Ohio.

SHAFTS

National Forge & Ordnance Co., Irvine, Warren County, Pa. Standard Pressed Steel Co., Jenkintown, Pa.

SHAFTS, Flexible

Jarvis, Chas. L., Co., Middletown, Conn.

SHAFTS, Hollow Bored

Bethlehem Steel Co., Bethlehem, Pa.

SHAFTS, Turned and Ground

Bethlehem Steel Co., Bethlehem, Pa.
Cumberland Steel Co., Cumberland, Md.
LaSalle Steel Co., Hammond, Ind.
National Forge & Ordnance Co., Irvine, Warren
County, Pa.
Republic Steel Corp., Union Drawn Steel Div.,
Republic Bidg., Cleveland 1, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St.,
Chicago 18, Ill.

SHAPER-PLANERS

Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, III.

SHAPERS

American Tool Works Co., Pearl and Eggleston Ave., Cincinnati, Ohio. Cincinnati Anger Co., Elam and Garrard Aves., Cincinnati, Ohio. Columbia Machinery & Engineering Corp., Hamilton I, Ohio. Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa. Hall Tool Co., 3240 Market St., Philadelphia 4, Pa. Pall Tool Co., 3240 Market St., Philadelphia 4, Pa.
Hendey Machine Co., Torrington, Conn.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Onsrud Machine Works, Inc., 3940 Palmer St.,
Chicago, III.
Rockford Mch. Tool Co., 2500 Kishwaukee St.,
Rockford, III.
Sheldon Mch. Co., Inc., 4240-4258 N. Knox
Ave., Chicago 41, III.

SHAPERS, Vertical

British Industries Corp., International Mchry. Div., 164 Duane St., New York, N. Y. Pratt & Whitney, West Hartford 1, Conn. Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, III.

SHAPES, Structural

Aluminum Co. of America, Oliver Bldg., Pitts-burgh, Pa.
Bethilehem Steel Co., Bethiehem, Pa.
U. S. Steel Corp. (Carnegie-Illinois Steel Corp. Div., Columbia Steel Co. Div., Tennessee Cool, Iron & R. R. Co., Div.), 436 7th Ave., Pittsburgh, Pa.

SHEARING MACHINERY

Bethlehem Steel Co., Bethlehem, Pa. Buffalo Forge Co., 490 Broadway, Buffalo, Bethlehem Steel Co., Bethlehem, Pa.
Buffalo Forge Co., 490 Broadway, Buffalo,
N. Y.
Cincinnati Shaper Co., Elam and Garrard Aves.,
Cincinnati, Ohio.
Cleveland Crane & Engrg. Co., Wickliffe, Ohio.
Cleveland Punch & Shear Works Co., 3917 St.
Clair Ave., N. E., Cleveland, Ohio.
Columbia Macchinery & Engineering Corp.,
Hamilton 1, Ohio.
Consolidated Mch. Tool Corp., Rochester, N, Y.
Ferracute Machine Co., Bridgeton, N. J.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago,
III. Hydropress, Inc., 350 Fifth Ave., New York 1, N. Y. N. Y.
Kling Bros. Engineering Works, 1320 No.
Kostner Ave., Chicago 51, III.
Morgan Engrg. Co., Alliance, Ohio.
Niagara Mch. & Tool Works, 683 Northland
Ave., Buffalo, N. Y.
O'Neil-Irwin Mfg. Co., Lake City, Minn.

Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, III. Watson-Stillman Co., Aldene Rd., Roselle, N. J. Yoder Co., 550 Walworth Ave., Cleveland, Ohio.

SHEARS, Alligator

Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio. Hydropress, Inc., 350 Fifth Ave., New York 1, N. Y.

SHEARS, Rotary

Bliss, E. W., Co., 1375 Raff Rd., S. W., Canton, Ohio. Ohio.

Brown & Sharpe Mfg. Co., Providence, R. I.

Cleveland Punch & Shear Works Co., 3917 St.

Clair Ave, N. E., Cleveland, Ohio.

Consolidated Mch. Tool Corp., Rochester, N. Y.

Hydropress, Inc., 350 Fifth Ave., New York 1,

N. Y. N. Y.
King Bros. Engineering Works, 1320 No.
Kostner Ave., Chicago 51, III.
Niagara Mch. & Tool Works, 683 Northland
Ave., Buffalo, N. Y.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St.,
Chicago 18, III.
Simonds Saw & Steel Co. (Knives), 470 Main
St., Fitchburg, Mass.
Union Twist Drill Co., Athol, Mass.

SHEARS, Squaring

Cincinnati Shaper Co., Elam and Garrard Aves.,
Cincinnati, Ohio.
Cleveland Punch & Shear Works Co., 3917 St.
Clair Ave., N. E., Cleveland, Ohio.
Columbia Machinery & Engineering Corp.,
Hamilton I, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Famco Machine Co., 3134 Sheridan Rd.,
Kenosha, Wis.
King Bros. Engineering. Warks, 1320 No.
Kostner Ave., Chicago 51, Ill.
Niagara Mch. & Tool Works, 683 Northland
Ave., Buffalo, N. Y.
Simonds Saw & Steel Co. (Blades), 470 Main
St., Fitchburg, Mass.

SHEET METALS

SHEET METALS

Aluminum Co. of America, Oliver Bldg., Pittsburgh, Pa.

American Brass Co., 25 Broadway, New York, N. Y.

Bethlehem Steel Co., Bethlehem, Pa.

Chase Brass & Copper Co., Inc., 1949 Rodney St., Waterbury 20, Conn.

Republic Steel Corp., Republic Bldg., Cleveland 1, Ohlo.

Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.

Solar Steel Corp., Union Commerce Bldg., Cleveland, Ohio.

U. S. Steel Corp. (Carnegie-Illinois Steel Co.)

U. S. Steel Corp. (Carnegie-Illinois Steel Co.)

Cloublia Steel Co. Div., Tennossee Coal, Iron & R. R. Co., Div.), 436 7th Ave., Pittsburgh, Pa.

SHEETS, Iron and Steel

Allegheny Ludium Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Republic Steel Corp., Republic Bldg., Cleveland
1, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St.,
Chicago 18, Ill.
U. S. Steel Corp. (Carnegie-Illinois Steel Corp.,
Div., Columbia Steel Co. Div., Tennessee
Coal, Iron & R. R. Co. Div.), 436 7th Ave.,
Pittsburgh, Pa.

SHIMS

Laminated Shim Co., Inc., Glenbrook, Conn.

Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohlo. Greenfield Top & Die Corp., Greenfield, Mass. Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y. Morse Twist Drill & Mch. Co., New Bedford, Mass. National Twist Drill & Tool Co., Rochester, Mich. Mich. Pratt & Whitney, West Hartford 1, Conn. Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Union Twist Drill Co., Athol, Mass.

SLOTTING MACHINES

Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohia. Consolidated Mch. Tool Corp., Rochester, N. Y.

Lobdell United Co., 2000 "G" St., Wilmington: 99, Del. Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, III.

SOCKETS

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill. Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio. Greenfield Top & Die Corp., Greenfield, Mass. Morse Twist Drill & Mch. Co., New Bedford, Mass. National Twist Drill & Tool Co., Rochester, National Twist Drill & Tool Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Standard Tool Co., 3950 Chester Ave., Cleve-land, Ohio.
Union Twist Drill Co., Athol, Mass.
Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

SPECIAL MACHINERY AND TOOLS American Steel Foundries, Elmes Engrg. Div., Paddock, Rd., and Tennessee Ave., Cincinnati, Ohio. Baldwin-Limo-Hamilton Corp., Philadelphia 42, Pa. Barnes Drill Co., 814 Chestnut, Rockford, III. Barnes, W. F. & John, Co., 201 St. Water St., Rockford, III. Bath, Cyril, Co., 6984 Machinery Ave., Cleveland 3, Ohio. Baush-Machine Tool Co., 156 Wason Ave., Springfield 7, Mass. Bethlehem Steel Co., Bethlehem, Pa. Bilgram Gear & Mch. Works, 1217-35 Spring Garden St., Philadelphia, Po. Birdsboro, Steel Fdry. & Mch. Co., Birdsboro, Pa. Blanchard Mch. Co., 64 State St., Cambridge, Mass. Mass.
Bliss, E. W., Co., 1375 Raff Rd., S. W., Canton,
Ohlo.

Proinsering Co., Chambersburg, Pania Braach Co., Detroit 13, Mich.
Columbia Machinery & Engineering Corp.,
Hamilton 1, Ohio.
Columbus Die-Tool & Mch. Co., 955 Cleveland
Ave., Columbus, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Earle Gear & Mch. Co., 4707 Stenton Ave.,
Wayne Junction, Philadelphia 44, Pa.
Espen-Lucas Mch. Works, Front St. and Girard
Ave., Philadelphia, Pa.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit
32, Mich. Pa. Ave., Philadelphia, Pa.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Grant Mfg. & Mch. Co., 90 Silliman St., Bridgeport 5, Conn.
Greenlee Bros. & Co., 12th and Columbia Aves,.
Rockford, Ill.
Honnifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Hartford Special Mchry. Co., 287 Hemestrad Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn. Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Hydraulic Press Mfg. Co., 300 Lincoln Ave.,
Mt. Gilead, Ohio.
Hydropress, Inc., 350 Fifth Ave., New York 1,
N. Y. Hydropress, Inc., 350 Fifth Ave., New York 1, N. Y.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, III.
John, B., Manufacturing Co., Ellis St., New Britain, Conn.
Kingsbury Mch. Tool Corp., Keene, N. H.
Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.
Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.
Lipe-Rallway Corp., 806 Emerson Ave., Syracuse, N. Y.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
Detroit 12, Mich.
Morgan Engrg. Co., Alliance, Ohio.
Morgan Engrg. Co., Alliance, Ohio.
Morth Machine Tool Co., 9 Harriet St., Cincinnati 3, Ohio.
Motch & Merryweather Mchry. Co., Pentan Bidg., Cleveland, Ohio.
National Acme Co., 170 E. 131st St., Gleveland, Ohio.
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
National Twist Drill & Tool Co., Rochester, Cleveland, Ohio. ational Twist Drill & Tool Co., Rochester,

(Continued on page 380)





For Your Stamped Parts Requirements

USE COUPON for more information

AMINATED SHIM COMP		
1911 UNION STREET, G	Marie Senatura	
Please send me more inf		IT BOTH
SHIMS	STAMPINGS	
	our problem with one of your	A SECTION OF THE RESIDENCE AND ADDRESS OF THE PARTY OF TH
	our problem with one of your	A SECTION OF THE RESIDENCE AND ADDRESS OF THE PARTY OF TH
We'd like to discuss to	our problem with one of your	Sales Engineers.

THE LUBRICANT OF MANY USES

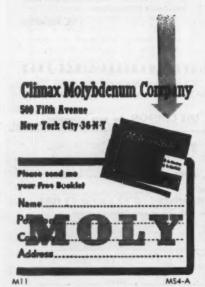


In the shop-

In the field

Moly-sulfide is a solid-film lubricant, highly successful in applications involving extreme pressures, high velocity, fretting, elevated temperatures and other difficult frictional conditions. We have compiled detailed records of 154 different applications of molybdenum sulfide to actual shop and field problems-some of which might be similar to your own.

Shopmen, engineers, lubrication specialists—write now for a copy of this new 40-page booklet.



Product Directory

New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.
New Jersey Gear & Mfg. Co., 1470 Chestnut Ave., Hillside, N. J.
Niagara Mch. & Toel Works, 683 Northland Ave., Buffalo, N. Y.
Pioneer Engrg. & Mfg. Co., 19679 John R St., Detroit, Mich.
Pioneer Pump & Mfg. Co., 19679 John R St., Detroit, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Reed-Prentice Corp., 677 Cambridge St., Worcester, Mass.
Rivert Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Sundstrand Mch. Tool Co., 2531 11th St., Rackford, Ill.
Laft-Peirce Mfg. Co., Woonsocket, R. I.
Turner Bros., Inc., 2625 Hilton Rd., Ferndale 20, Mich.
Union Twist Drill Co., Athol, Mass.
V & O Press Co., Div. Emhart Mfg. Co., Hudson, N. Y.
Waltham Machine Works, Newton St., Waltham Machine Works, Newton St., Waltham Machine Corp., Senton Ave. and Louden Sf., Philadelphia, Pa.
Zogar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

SPEED REDUCERS

Atlantic Gear Works, Inc., 200 Lafayette St., New York 12, N. Y.
Boston Geer Works, 3200 Main St., North Quincy 71, Mass.
Brad Foote Gear Works, 1309 S. Cicero Ave., Cicero 50, Ill.
Cleveland Worm & Gear Co., 3249 E. 80th St., Cleveland, Ohio.
Cone-Drive Gears, Div. Michigan Tool Co., 7171 E. McChichols Rd., Detroit 12, Mich., Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Ceneral Electric Co., Schenectady, N. Y.
Ohio Gear Co., 1333 E. 179th St., Cleveland, Ohio. Ohio,
Perkins Mch. & Gear Co., Box 1611 Springfield
2, Mass. 2, Mass. hiladelphia Gear Works, Inc., Erie Ave. and G St., Philadelphia, Pa. repard Niles Crane & Hoist Corp., Montour Falls, N. Y. win Disc Clutch Co., 1361 Racine St., Racine,

SPINDLES, Grinding

Ex-Cell-O Corp., 1200 Oakman Bivd., Detroit 32, Mich.
Pope Mchry. Corp., Haverhill, Mass.

SPINNING LATHES

See Chucking Machines.

SPROCKET CHAINS

Atlantic Gear Works, Inc., 200 Lafayette St., New York 12, N. Y. Boston Gear Works, 3200 Main St., North Quincy 71, Mass. Ohio Gear Co., 1333 E. 179th St., Cleveland, Ohio Philadelphia Gear Works, Inc., Erie Ave. and G St., Philadelphia, Pa.

SPROCKETS

Atlantic Gear Works, Inc., 200 Lafayette St., New York 12, N. Y.
Boston Gear Works, 3200 Main St., North Quincy 71, Mass.
Hartford Special Mchry, Co., 287 Homestead St., Hartford, Conn.
Ohio Gear Co., 1333 E. 179th St., Cleveland, Ohio.
Philadelphia Gear Works, Inc., Erie Ave. and G St., Philadelphia, Pa.
Stahl Gear & Mch. Co., 3901 Hamilton Ave., Cleveland 14, Ohio.

STAMPINGS, All Metal

LaSalle Steel Co., Hammond, Ind.

STAMPINGS, Sheet Metal

Aluminum Co. of America, Oliver Bldg., Pitts-burgh, Pa.
Dayton Rogers Mfg. Co., 2824 13th Ave., S., Minneapolis 7, Minn.
Laminated Shim Co., Inc., Glenbrook, Conn.
Republic Steel Corp., Niles Steel Products Div., Republic Bldg., Cleveland 1, Ohio.
Revere Copper & Brass Inc., 230 Park Ave., New York, N. Y.

Allegheny Ludium Steel Corp., Pittsburgh, Pa. American Steel & Wire Co., Div. U. S. Steel Corp., Rockefeller Bldg., Cleveland, Ohio. Bethlehem Steel Co., Bethlehem, Pa. Carpenter Steel Co., Reading, Pa. Crucible Steel Co. of America, Chrysler Bldg., New York, N. Y. Firth-Sterling Inc., McKeesport, Pa. Frosse, Peter A., & Co., Inc., 17 Grand St., New York 13, N. Y. Holliday, W. J., & Co., Hammond, Ind. National Farge & Ordnance Co., Irvine, Warren County, Pa. Republic Steel Corp., Republic Bldg., Cleveland J., Ohio. Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill. Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass. Solar Steel Corp., Union Commerce Bldg., Cleveland, Ohio. Timken Roller Bearing Co., Canton, Ohio. U. S. Steel Corp. (American Steel & Wire Co. Div., Carnegie-Illinois Steel Corp., Div., Columbia Steel Co., Div., Tennessee Coal, Iron & R. R. Co. Div.), 436 7th Ave., Pittsburgh, Pa. U. S. Steel Supply Div., U. S. Steel Co., 208 S. La Salle St., Chicago 4, Ill.,

STEEL, Cold Drawn

STEEL, Cold Drawn

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
American Steel & Wire Co., Div. U. S. Steel
Corp., Rockefeller Bidg., Cleveland, Ohio.
Bethiehem Steel Co., Bathlehem, Pa.
Crucible Steel Co. of America, Chrysler Bidg.,
New York, N. Y.
Firth-Sterling Inc., McKeesport, Pa.
LaSalle Steel Co., Hammond, Ind.
Republic Steel Corp., Union Drawn Steel Div.,
Massillon, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St.,
Chicago 18, Ill.
Solar Steel Corp., Union Commerce Bidg.,
Cleveland, Ohio.
Timken Roller Bearing Co., Canton, Ohio.
U. S. Steel Corp. (American Steel & Wire Co.,
Div.), 436 7th Ave., Pittsburgh, Pa.
Wheelock-Lovejay & Co., Inc., Combridge, Mass.

STEEL, High Speed Tool

STEEL, High Speed Tool

Allegheny Luddium Steel Corp., Pittsburgh, Pa.
Armstrong Bros. Tool Co., 5200 W. Armstrong
Ave., Chicago, Ill
Bethiehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Chrysler Bldg.,
New York, N. Y.
Firth-Sterling Inc., McKeesport, Pa.
Firth-Sterling Inc., McKeesport, Pa.
Republic Steel Corp., Republic Bldg., Cleveland
1, Ohlo.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St.
Chicago 18, Ill.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Solar Steel Corp., Union Commerce Bldg.,
Cleveland, Ohio.
Wheelock-Lovejoy & Co., Inc., Cambridge, Mass.

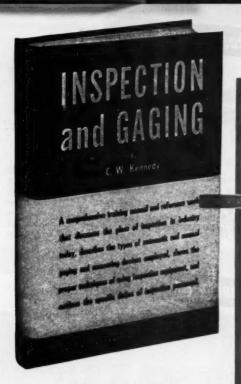
Steel, Machine

Steel, Machine

Bethlehem Steel Co., Bethlehem, Po. Carpenter Steel Co., Reading, Po. Crucible Steel Co. of America, Chrysler Bldg., New York, N. Y.
Holliday, W. J., & Co., Hammond, Ind. LaSalle Steel Co., Hammond, Ind. Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Solar Steel Corp., Union Commerce Bldg., Cleveland, Ohio.
Timken Roller Bearing Co., Canton, Ohio.
Wheelock-Lovejoy & Co., Inc., Cambridge, Mass.

STEEL, Stainless

STEEL, Steinless
Allegheny Ludium Steel Corp., Pittsburgh, Pa. American Steel & Wire Co., Div. U. S. Steel Corp., Rockefeller Bldg., Cleveland, Ohio. Bethiehem Steel Co., Bethiehem, Pa. Carpenter Steel Co., Reading, Pa. Crucible Steel Co. of America, Chrysler Bldg., New York, N. Y.
Firth-Sterling Inc., McKeesport, Pa. Frasse, Peter A., & Co., Inc., 17 Grand St., New York 13, N. Y.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jor. T.. & Son, Inc., 2558 W. 16th St., Chicago 18, III.
Timken Roller Bearing Co., Canton, Ohio.
U. S. Steel Corp. (American Steel & Wire Co. Div., Carnegie-Illinois Steel Corp. Div.), 436
7th Ave., Pittsburgh, Pa.
Wheelock-Lovejoy & Co., Inc., Cambridge, Mass.
(Continued on page 384) (Continued on page 384)



CONTENTS

Chapter

- 1 The Need and Function of Inspec-
- 2 How Specifications Aid the In-
- 3 Tolerances and Allowances
- 4 How Standards Aid the Inspector
- 5 Basic Principles and Techniques of Measurement
- 6 Fixed Gages
- 7 Surface Plate Methods and Equipment
- **8** Mechanical Indicating Equipment
- 9 Electrical and Air Indicating Equip-
- 10 Optical Measuring and Inspection Equipment
- 11 Gaging and Inspection of Screw Threads
- 12 Special Measuring and Inspection
- 13 Gage Checking and Calibration
- 14 100 Per Cent Inspections
- 15 Quality Control and Sampling
- 16 Process Inspections
- 17 Hints on Making a Good Job Better

INSPECTION ...

More Important Today than Ever Before!

The production of new defense equipment . . . increasingly heavier manufacturing schedules . . . more rigid inspections . . . the necessity for using many unskilled or partially trained workers . . . these are some of the conditions that make a thorough knowledge of inspection more important than ever before.

INSPECTION and GAGING covers in a concise yet comprehensive manner the many phases of inspection work and their application to present-day manufacturing operations. It describes the variety of manual and automatic measuring devices and gages which are available, discusses their specific functions and the specialized techniques for using them. In addition, it analyzes the methods and duties of different types of inspectors.

INSPECTION and GAGING is written by a well-qualified authority on the subject. Mr. Clifford W. Kennedy is Quality Control Engineer for the Federal Products Corporation, makers of gages and precision measuring equipment, and in addition has had experience with a number of manufacturing concerns which has brought him into contact with all types of inspection involved in mass production.

INSPECTION and GAGING is primarily written for the training of inspection personnel, to give them a fund of basic information necessary for performing their duties efficiently. It is eminently suitable as a training course text.

For inspection supervisors, it provides a comprehensive reference manual about all phases of inspection. Plant managers will find the book useful in giving them an over-all picture of the different types of inspection equipment, methods of inspection and duties of personnel. Quality control engineers and technicians will find that INSPECTION and GAGING gives them a comprehensive picture of inspection operations and their relation to quality control. Subcontractors, small plant managers and others will use INSPECTION and GAGING to help them in setting up effective systems.

512 PAGES 317 ILLUSTRATIONS \$7.50

Postpaid in U. S.

Order your copy of INSPECTION and GAGING today! Just mail the coupon and the book will be sent to you postpaid at once. If you wish, you may take advantage of our Five Day Free Inspection Plan to examine the book without cost.

Please send C \$7.50 each.	opies of INSPECTION and GAGING at
☐ Payment enclosed.	Send under Five Day Free Inspection Plan.
	of \$2.50 enclosed, balance we installments.
Name	
Company	
Street and No	
City	ZoneState
Home Address(Please fill in if you	want book sent to your home)
City	ZoneState

MICRO-STEP **GAGING SYSTEM**

HERE, for the first time is the means for directly applying gage blocks to thousands of precision measurement jobs which previously could be checked only with less accurate gaging setups.

-the means for securing micro-inch accuracy on inside as well as outside measurements.

-the means for assembling gage-block gages of every conceivable type, including gages up to 72" long.

-the means for making pin gages, snap gages, indicating gages, height gages, depth gages, go and no-go gages for use not only in the lab, but in the toolroom and shop as well.

Here, in short, is a practical, economical means of securing superior dimensional quality control, of reducing rejects and wasted time, material and money.

Key to the system are the new DoALL Gage Holders and gage block-accurate End Standards with full exposed measuring surfaces. No other gage system offers such a combination.

For complete details, call your local DoALL Sales-Service Store, or write:

THE DOALL COMPANY

254 N. Laurel Ave., Des Plaines, Illinois



ASK FOR NEW CATALOG

so block, and stand

WITH THESE COMPONENTS . . .

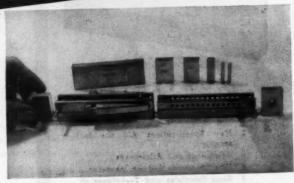


DoALL BLOCKS

Accuracy second to none in the world. Most complete line of sets available, 6 to 118 pieces, including a new set having gage blocks up to 20.000" long.

QUICKLY ASSEMBLED LIKE THIS . . .

de



Select the holder, end standards and gage block combination for any gage you need.

YOU MAKE GAGES LIKE THESE . . .



Internal gage-block gage calibrating in-dicating snap gage.



Assembled height gage for checking



Height gage with scriber end stand for layout work.

GB-13

















NEW DOALL END STANDARDS

Here are gage block-accurate End Standards with fully exposed measuring surfaces which, when used with DoALL Gage Holders, make possible gage-block gages for every internal or external measuring job.



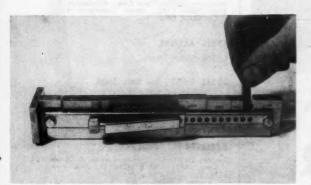
NEW DOALL GAGE HOLDERS

Channel-type holders available for making gages from 2" to 72" length. Quickly, easily assembled. Also a caliper holder for gages up to 6". For use only with DoALL End Standards and standard rectangular gage blocks.



NEW DOALL DIAL INDICATOR ASSEMBLIES

Here is the means of mounting dial indicators in any desired position in a DoALL Gage Holder to make indicating gages of all kinds.



2. Assemble holder, anap detent pins through end standards and insert correct gage block combination.



3. Press clamps into channel holes and tighten thumb screws snugly. That is all there is to it.



Internal indicating pin gage checking parts in the shop.



Pre-calibrated indicating ** comparator made with DoALL parts.

YAUGURDAN BUTHETHING OFF



Micro-inch accurate indicating snap yage in use in the shop.



Go and no-go gage assembled with Micro-Step components.



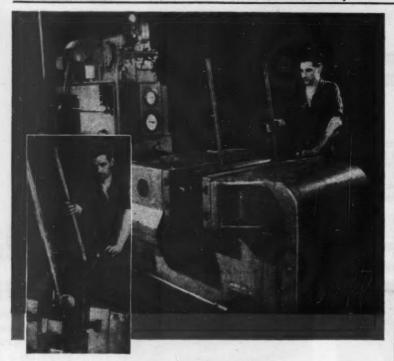












Mercury Mfg. Co. does a better job twice as fast with a

FARQUHAR Hydraulic Press

Mercury Manufacturing Co., Chicago, Ill., producers of fork trucks, tractors and trailers, uses a 200-Ton Farquhar Horizontal Bulldoser press to make forgings and stampings and to form plates. In operation 8 hours a day, the press does most jobs twice as fast as the mechanical bulldozer used formerly, and better speed control produces better work.

In addition, many pieces of work that used to be farmed out are now done at Mercury—providing better production and quality control, and effecting additional savings of time.

In the operation shown above, high carbon brazed steel is bent quickly and accurately. In other operations, the press forms heads on bolts, legs for caster forms, and bends structural T frames.

Mercury reports very small maintenance costs, and sums up the company's satisfaction with, "It's the best!"

Farquhar Presses Cut Your Costs

Just one more example of cost-cutting Farquhar performance in heavy production! Farquhar Presses are built for the job... assure faster production due to rapid advance and return of the ram... greater accuracy because of the extra guides on moving platen...easy, smooth operation with finger-tip controls... longer life due to positive control of speed and pressure on the die...long, dependable service with minimum maintenance cost!

Farquhar engineers are ready to help solve whatever production problem you may have. Give them a call.

Send for Free Catalog showing Farquhar Hydraulic Presses in all sizes and capacities for all types of industry. Write to: A. B. FARQUHAR Co., Hydraulic Press Dept., 1504 Duke St., York, Pa.



-A. B. FARQUHAR COMPANY Division of THE OLIVER CORPORATION-

STEEL, Strip and Shoet

Allegheny Ludium Steel Corp., Pittsburgh, Pa. American Steel & Wire Co., Div. U. S., Steel Corp., Rockefeller Bldg., Cleveland, Ohio. Bethiehem Steel Co., Bethlehem, Pa. Frasse, Peter A., & Co., Inc., 17 Grand St., New York 13, N. Y. Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio. Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill. Solar Steel Corp., Union Commerce Bldg., Cleveland, Ohio. U. S. Steel Corp. (American Steel & Wire Co. Div., Carnegie-Illinois Steel Corp. Div., Columbia Steel Co. Div., 18 Tennessee Coal, Iron & R. R. Co. Div.), 436 7th Ave., Pittsburgh, Pa.

STEEL, Tool and Die

Allegheny Ludium Steel Corp., Pittsburgh, Pa. Carpenter Steel Co., Reading, Pa. Firth-Sterling Inc., McKeesport, Pa. Republic Steel Corp., Republic Bidg., Cleveland 1, Ohio. Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass. Solar Steel Corp., Union Commerce Bidg., Cleveland, Ohio.

STEEL, Zinc, Tin and Copper Coated Strip

Allegheny Ludlum Steel Corp., Pittsburjgh, Pa. Solar Steel Corp., Union Commerce Bldg., Cleveland, Ohio.

STEEL ALLOYS

See Alloys, Steel.

STEEL BARS-See Bars, Steel.

STEEL STOCK GROUND FLAT

Brown & Sharpe Mfg. Co., Providence, R. I. Starrett, The L. S., Co., Athol, Mass.

STELLITE

Haynes Stellite Div., Union Carbide & Carbon Corp. (Alloy), 30 E. 42nd St., New York, N. Y.

STOCKS, Die

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicogo, III.
Butterfield Div., Union Twist Drill Co., Derby Line, Vt.
Card, S. W., Mfg. Co., Div. Union Twist Drill Co., Mansfield, Mass.
Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Praft & Whitney, West Hartford 1, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Threadwell Tap & Die Co., 16 Arch St., Greenfield, Mass.

STONES, Oil or Sharpening

Bay State Abrasive Co., Westboro, Mass. Carborundum Co., Buffalo Ave., Niogara Falls, N. Y. Norton Co., 1 New Bond St., Worcester 6, Mass.

STOOLS

Standard Pressed Steel Co., Jenkintown, Po.

STRAIGHTEDGES

Rahn Granite Surface Piate Co., 637 N. Western Ave., Dayton, Ohio. Starrett, The L. S., Co., Athol, Mass.

STRAIGHTENERS, Flat Stock and Wire

Nilson, A. H., Mch. Co., 1506 Railroad Ave., Bridgeport, Conn. U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

STRAIGHTENING MACHINERY

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio. Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa. (Combersburg Engrg. Co., Chambersburg, Pa. (Continued on page 388)



"Pop says they're givin' production like his



No. 935—2 QUICE CHANGE SEAR TURRET LATHE 11" Swing, 1" Collet Capacity, 1%" Spindle Hole, 43%" Bed

Logan LATHES!"

METALWORKING PRODUCTION lines in many industries have found Logan Lathes the key to profitable operation. Set-ups are faster. Power cost is less. The sustained accuracy of the Logan ball bearing spindle holds close tolerances at high speeds. The rugged durability of Logan construction keeps production going at top efficiency and minimum cost per finished part. With their 11" swing, 1" collet capacity and 1%" spindle hole, rugged accurate Logan Lathes are standard tools on many of industry's most efficient production lines. Remember, as you plan for low cost production, no other lathe of comparable specifications can match Logan economy.

See your Logan Dealer or Write for the Logan Lathe and Shaper Catalog

LOOK TO LOGAN FOR BETTER LATHES AND SHAPERS

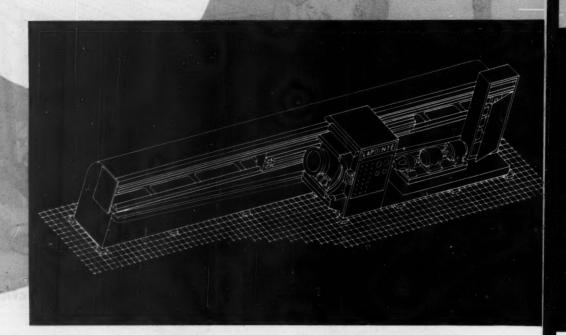
LOGAN ENGINEERING CO.

4901 West Lawrence Avenue, Chicago 30, Illinois

MACHINERY, November, 1952-385

POINTE breaks with tradition

offers tomorrow's BROACHING



capable of BROACHING SPEEDS in excess of 150 fpm!

Faster than ever before, this DUAL SPEED Lapointe Broaching Machine is available with strokes ranging from 66 inches to 200 inches. All sliding members are lined with natural phenolic plates (another exclusive Lapointe feature) and slide on heat treated mechanite ways. Clamping fixtures operate on hydraulic power.

Rugged, heavy, and rigid, this machine can be equipped with drives up to 200 hp for smooth, powerful high-speed broaching. It embodies the capability, flexibility, simplicity and "guts" that no previously-designed broaching machine ever has had . . . and the maintenance factor is almost negligible.

In short, this machine represents exactly what industry has come to expect from LAPOINTE, the world's pioneer in the art of broaching.

FASTER BROACHING OF JET ENGINE PARTS AND AUTOMOT



. and, years ahead of time,

SPEED today!

50 YEARS IN BROACHING / We're the eldest in the world . 1902 - GOLDEN AMHIVERSARY - 1902

Full information about this machine will be given if you ask for literature on the SRHE-7



This new

LAPOINTE Electric Drive

SURFACE BROACHING MACHINE

removes the largest amount of material in the shortest possible time, due to its remarkable broaching speed of 150 fpm — and more!

No longer something to hope for in the future, this new machine has already completely proven itself... several have been in service for some time and are performing production miracles in nationally known plants.

DUAL SPEED gives great flexibility!

An exclusive feature is the DUAL SPEED (patent pending), which makes it possible to broach at a certain predetermined speed for any part of the stroke, and at any other speed for the remainder of the stroke.

This opportunity to combine roughing and finishing operations in the same stroke indicates the machine's flexibility and is the reason why this newest Lapointe machine is so useful for the broaching of certain jet engine parts and automotive parts.

With this outstanding development in broaching — and others to come — it is well to remember now, more than ever, that Lapointe can accept responsibility for the complete job — broaching machines, broaching tools, and fixtures.

THE

LAPOINTE

MACHINE TOOL COMPANY

HUDSON, MASSACHUSETTS . U. S. A.



THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES

Colonial Broach Co., Detroit 13, Mich.
Columbia Machinery & Engineering Corp.,
Hamilton 1, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Hannifin Corp., 1101 5. Kilbourn Ave., Chicago, Hydroulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio. Hydropress, Inc., 350 Fifth Ave., New York 1, N. Y. N. Y.
Lake Erie Engrg. Corp., Kenmore Station,
Buffalo, N. Y.
Morse Twist Drill & Mch. Co., New Bedford,
Mass.
Springfield Mch. Tool Co., Springfield, Ohlo.
Watsan-Stillman Co., Aldane Rd., Roselle, N. J.

STRIPPING UNITS, Die

Wales-Strippit Corp., North Tonawanda, N. Y.

STUD SETTERS

Errington Mechanical Laboratory, Inc., 24 Nor-wood Ave., Stopleton, S. I., N. Y. Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, III.

SUB-PRESSES

Waltham Machine Works, Newton St., Wal-

SUPERFINISHING MACHINES

Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.

SURFACE PLATES

See Plates, Surface.

SWAGING MACHINES

Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio. Hartford Special Mehry. Co., 287 Homestead St., Hartford, Conn. Terrington Co., Tarrington, Conn.

SWITCHES

Allen-Bradley Co., 1326 S. 2nd St., Milwaukee, Wis.

Eiectro-Snap Switch & Mfg. Co., 4218-30 West Lake St., Chicago 24, III. General Electric Co., Schenectady, N. Y., Micro Switch Div., Minneapolis-Honeywell Regulator Co., Freeport, III. National Acme Co., 170 E. 131st St., Cleve-land, Ohio. Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

TACHOMETERS

Bristol Co., Platts Fails, Waterbury, Conn. Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y. Veeder-Root, Inc., 20 Sargent St., Hartford, Conn.

TAPER PINS, Standard

Chicago Screw Co., Bellwood, III. Morse Twist Drill & Mch. Co., New Bedford, Pratt & Whitney, West Hartford 1, Conn.

TAP HOLDERS

Burg Tool Manufacturing Co., 3743 Durango Ave., Los Angeles 34, Calif. Errington Mechanical Laboratory, Inc., 24 Nor-wood Ave., Stapleton, S. I., N. Y. McCrosky Tool Corp., 1938 Thomas St., Mead-ville, Pa. Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.

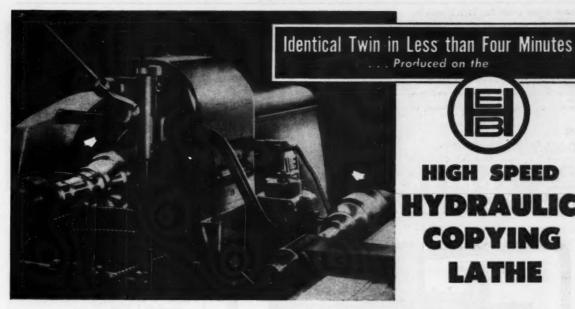
TAPPING ATTACHMENTS AND DEVICES

Avey Drilling Machine Co., 25 E. Third St., Covington, Ky. Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohio. Brown & Sharpe Mrg. Co., Providence, R. I. Buhr Mch. Tool Co., 839 Buhr St., Ann Arbor, Mich. Mich.
Commander Mfg. Co., 4233 W. Kinzle St.,
Chicago 4, III.
Errington Mechanical Laboratory, Inc., 24 Norwood Ave., Stapleton, S. I., N.,
Etto Tool Co., Inc., 592 Johnson Ave., Brooklyn, N.,
Jorvis, Chos. L., Co., Middletown, Conn.
Leland-Gifford Co., 1025 Southbridge St., Wor-Leland-Gifford Co., 1025 Southbridge St., Wor-cester, Mass. McCrosky Tool Corp., 1938 Thomas St., Mead-ville, Po. Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill. Snow Mg. Co., 435 Eastern Ave., Bellwood, Ill. Thriftmaster Products Corp., 1076 N. Plum St., Lancaster, Pa.

TAPPING MACHINES

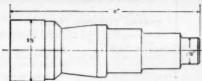
Avey Drilling Machine Co., 25 E. Third St., Covington, Ky.
Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockferd, Ill.
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Bodine Corp., 317 Mt. Grove St., Bridgeport, Conn. Conn. Buffalo Forge Co., 490 Broadway, Buffalo, N. Y. Buhr Mch. Tool Co., 839 Buhr St., Ann Arbor, Mich.
Chollenge Mchry. Co., Grand Haven, Mich.
Cleveland Tapping Mch. Co., 1201 Camden
Ave., S. W., Canton 6, Ohio.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Greeniee Bros. & Co., 12th and Columbia Aves.,
Rockford, Ill.
Homilton Tool Co., 834 South 9th St., Hamilton, Ohio.
Hartford Special Mchry. Co., 287 Hamestead
St., Hartford, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland 2,
Ohio. Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Jarvis, Chas. L., Co., Middletown, Conn.
Koufman Manufacturing Co., Manitewac, Wis.
Kingsbury Mch. Tool Corp., Keene, N. H.
Leland-Gifford Co., 102 Southbridge St., Worcester, Mass.
Molline Tool Co., 102 20th St., Molline, Ill.
Morris Machine Tool Co., 9 Harriet St., Clacinnati 3, Ohio.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
National Automatic Tool Co., Inc., S. 7th and
N Sts., Richmond, Ind. (Continued on page 390)







HIGH SPEED HYDRAULIC COPYING LATHE





Examine this miracle of modern engineering made possible by the H.E.B. High Speed Hydraulic Copying Lathe. Pictured at the right is the turned master; at the left you see its identical twin - a shaft of S.A.E. 4130 steel accurately copied in just 3% minutes. That's breathtaking speed for such precision finish.

The H.E.B.'s patented tracer device is built into this ruggedly constructed lathe. There are no troublesome attachments, and setting time takes no more than 10 to 20 minutes. Experience on production lines proves time and again that finished parts are copy-turned up to 300% faster than on multi-tool lathes!

With its 20 H.P. motor the OP Model takes heavy cuts with carbide tools at spindle speeds 50 to 3600 RPM. GT Models with rotating pattern are designed for copying an infinite variety of irregular, non-circular work.

More than 1000 of these modern copying lathes are now in use worldwide . . . designed and built in France by H. Ernault Batignolles, manufacturers of machine tools for almost a hundred years.

Catalogs on both of these machines, including complete specifications, are available upon request. Write or telephone now for catalog or demonstration.

TYPE 178 CONSTAN CARBIDE TOOL GRINDER

The Constan Grinder is specially designed for sharpening carbide tools, etc., without attachments . . . lengthens their life and improves cutting capacity. Heavily built, the Constan combines smooth operation and ea of setting with great rigidity. The inclinable table incorporates a ball and socket vise so that the teal may be clemped in any position. Twe diamond wheels—ene for roughing and one for finishing—are mounted on the wheel head, and each may easily be brought into position. The machine may also be used for sharpening milling cutters.





IMMEDIATE DELIVERY

H. E. B. MACHINE TOOLS, INC. 475 FIFTH AVENUE, NEW YORK 17, N. Y. Telephone: LExington 2-0266

COPYING LATHES . ENGINE LATHES WITH COPYING ATTACHMENTS . TOOL ROOM LATHES . CARBIDE TOOL GRINDERS MACHINERY, November, 1952-389 Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, III., Snow Mfg. Co., 435 Eastern Ave., Bellwood, III. Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

TAPPING MACHINES, Nut

Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohlo.
National Machinery Co., Greenfield and Stanton Sts., Tiffin, Ohlo.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.

Bath, John, Co., Inc., Worcester, Mass. Besly-Welles Corp., Beloit, Wis. Butterfield Div., Union Twist Drill Co., Derby Line, Vt., Mfg. Co., Div. Union Twist Drill Co., Derby Line, Vt., Mfg. Co., Div. Union Twist Drill Co., Mansfield, Mass.
Continental Tool Works, Div. Ex-Cell-O Corp., Detroit 32, Mich., Detroit Tap & Tool Co., Detroit, Mich. Geometric Tool Co., Westville Station, New Haven 15, Conn. Greenfield Top & Die Corp., Greenfield, Mass. Hy-Pro Tool Co., 100 Mt. Pleasant Ave., New Bedford, Mass. Landis Mch. Co. (Solid Adjustable), Waynes-boro, Pa. Morse Twist Drill & Mch. Co., New Bedford,

Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Threadwell Tap & Die Co., 16 Arch St., Greenfield, Mass.
Winter Bros. Co., Rochester, Mich.
Wood & Spencer Co., 1930 E. 61st St., Cleveland, Ohio.

TAPS, Collapsing

Geometric Tool Co., Westville Station, New Haven 15, Conn. Landis Mch. Co., Waynesboro, Pa. National Acme Co., 170 E. 131st St., Cleveland, Ohio. Sheffield Corp., 721 Springfield, Dayton, Ohio. **TELESCOPES**, Alignment

Engis Equipment Co., 431 S. Dearborn St., Chicago 5, III.

THERMOMETERS, Indicating and Recording

Bristol Co., Platts Mills, Waterbury, Conn.

THREAD CUTTING MACHINERY

Brown & Sharpe Mfg. Co., Providence, R. I. Cleveland Tapping Mch. Co., 1201 Camden Ave., S. W., Canton 6, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Davis & Thompson Co., 6411 W. Burnham St., Milwaukee 14, Wis.
Eastern Mch. Screw Corp., New Haven, Conn. Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Grant Mfg. & Mch. Co., 90 Silliman St., Bridgeport 5, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.

Hill Acme Co., 1201 W. 63th St., Cleveland S., Ohio.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Kaufman Manufacturing Co., Manitowoc, Wis.
Landis Mch. Co., Waynesboro, Pa.
Prott & Whitney, West Hartford 1, Conn.
Procunier Safety Chuck Co., 18 S. Clinton St.,
Chicago, Ili.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35 Mass.

Novert Latine & Grinder, Inc., Brighton, Boston 35, Mass. Rogers Machine Works, Inc., Buffalo 10, N. Y. Snow Mfg. Co., 435 Eastern Ave., Bellwood, III. Taft-Peirce Mfg. Co., Woonsocket, R. I. Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

THREAD CUTTING TOOLS

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill. Detroit Tap & Tool Co., Detroit, Mich. Eastern Mch. Screw Corp., New Haven, Conn. Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit Ex-Cell-O Corp., 1200 Oakman biva., Detroit. 32, Mich.

Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Geometric Tool Co., Westville Station, New Haven 15, Conn.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.

Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio. Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Landis Mch. Co., Waynesboro, Pa.
Pratt & Whitney, West Hartford 1, Conn.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Wesson Co., 1220 Woodward Heights Blvd.,
Ferndale, Mich.
Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

THREAD GAGES

See Gages, Thread.

THREAD GRINDING MACHINES

See Grinding Machines, Thread.

THREAD MILLING MACHINES

Cross Co., 3250 Bellevue Ave., Detroit 7, Mich. Pratt & Whitney, West Hartford 1, Conn. Sheffield Corp., 721 Springfield, Dayton, Ohio. Waltham Machine Works, Newton St., Wal-tham, Mass.

THREAD ROLLING ATTACHMENTS

Salvo Tool & Engineering Co., 26441 Gratiot Ave., Roseville, Mich.

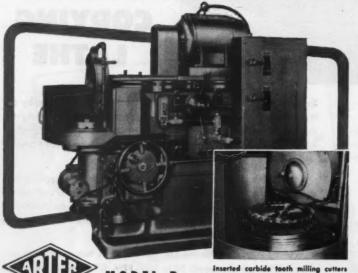
THREAD ROLLING MACHINES

Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn. Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohlo. Hirschmann, Carl, Co., 30 Park Ave., Man-hasset, N. Y. V & O Press Co., Div. Emhart Mfg. Co., Hudson, N. Y.

TIN AND TERNEPLATES

Bethlehem Steel Co., Bethlehem, Pa. Republic Steel Corp., Republic Bidg., Cleveland 1, Ohio.

(Continued on page 392)



... for work requiring the utmost precision for flatness, size and finish. For angular grinding, a rigidly mounted spindle insures concentricity. Electric magnetic chuck, 13" or 17". holds work as small as 1-1/2" diameter. Smaller parts held by shellac on iron plate. Shoulder, filet diameters ground with side of wheel.

LIC ROTA

hinder

Inserted carbide tooth milling cutters ground on standard machine. Extra equipment permits revolving grinding wheel and chuck in either direction, independently controlled.



Machine built especially for grinding 45° angles on cutters. Flat surfaces also can be ground. Both wheel and chuck have reversible direction drives.

Write today for complete details and specifications



want to show your management some BIG SAVINGS? Install Hapman TUBULAR CONVEYORS



FOR METAL CHIP AND DUST REMOVAL ON 3 TYPES OF INSTALLATIONS:

DEPARTMENT OR PLANT-WIDE CHIP-CONVEYING SYSTEMS...

Here's the latest of many complete Hapman chiphandling systems installed in major automotive plants. In all cases, they've proved their ability to pay big dividends fast.



AS ORIGINAL COMPONENTS ON NEW MACHINES AND EQUIPMENT...

You can get low-cost, automatic chip, dust or sludge removal on new machines of many types by specifying Hapman Conveyors as original equipment. We cooperate with the tool builder.



ADDED TO EXISTING MACHINES OF MANY TYPES...

You can also show your Management important, quick-return savings by installing Hapman Conveyors on existing equipment such as these profile milling machines — or on broaching machines, grinders, drills, quench tanks, etc. You can prove the savings —



INVESTIGATE NOW - WRITE FOR BULLETIN M-1152





olar Steel Corp., Union Commerce Bldg., Cleveland, Ohio. 5. Steel Corp. (Carnegie-Illinois Steel Corp. Div, Columbia Steel Co. Div., Tenneosee Cool, Iron & R. R. Co., Div.), 436 7th Ave., Pittsburgh, Po. U.

TOOL BITS, High Speed Steel

Allegheny Ludlum Steel Corp., Pittsburgh, Pa. Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, III. Carpenter Steel Co., Reading, Pa. Crucible Steel Co., Reading, Pa. Crucible Steel Co., of America, Chrysler Bidg., New York, N. Y. Firth-Sterling Inc., McKeesport, Pa. Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich. Pyerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, III. Simonds Saw & Steel Co., 470 Main St., Fitch-Jurg, Mass. Wesson Co., 1220 Woodward Heights Bivd., Wheelock, Levejoy & Co., Inc., Cambridge, Mass. Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

TOOL BITS, Special Alloy

Allegheny Ludium Steel Corp., Pittsburgh, Pa. Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio. Firth-Sterling Inc., McKeesport, Pa. Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich. Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y. Kennametal, Inc., Latrobe, Pa. Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

TOOL GRINDERS

See Grinding Machines for Sharpening, Turning and Planing Tools.

TOOL HOLDERS

Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, III.
Bloke, Ed., Co., 442 Cherry St., West Newton 65, Mas.
Burg Tool Manufacturing Co., 3743 Durango Ave., Los Angeles 34, Calif.
Davis Baring Tool Div., Gladlings & Lewis Machine Tool Co., Fond du Lac, Wis.
Loveloy Tool Co., Inc., Springfield, Vt.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit, Mich.
Millholland, W. K., Mchry. Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Portage Double Tool Co., 1036 Sweitzer Ave., Akron 11, Ohio.
R and L Tools, 1825 Bristol St., Philadelphia 40, Pa.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. V.

TOOLMAKERS' INSTRUMENTS

Ames, B. C., Co., Waltham 54, Mass. Brown & Sharpe Mfg. Co., Providence, R. I. Scherr, George, Co., Inc., 200 Lafayette St., New Yark 12, N. Y. Starrett, The L. S., Co., Athol, Mass.

TOOL STEEL

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Chrysler Bldg.,
New York, N. Y.
Firth-Sterling Inc., McKeesport, Pa.
Republic Steel Corp., Republic Bldg., Cleveland
1, Ohlo.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St.,
Chicago 18, III.
Solar Steel Corp., Union Commerce Bldg.,
Cleveland, Ohio.

TOOLS, Carbide-Tipped

Adamas Carbide Corp., 999 South 4th St., Harrison, N. J. Allegheny Ludlum Steel Corp., Pittsburgh, Pa.

Atrax Co., Newington, Cenn.
Carboloy Dept., General Electric Co., Box 237,
Roosevelt Park Annex, Detroit 32, Mich.
Cleveland Twist Drill Co., 1242 E. 49th St.,
Cleveland, Ohio.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit
32, Mich.
Firth-Sterling Inc., McKeesport, Pa.
Gorham Tool Co., 14400 Woodrow Wilson,
Detroit, Mich.
Colonial Broach Co., Detroit 13, Mich.
Kennametal, Inc., Latrobe, Pa.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Metal Carbide Corp., Youngstown, Ohio.
Morsa Twist Drill & Mch. Co., New Bedford,
Mass.
Severance Tool Industries, Inc., 636 Iowa Ave.,
Saginaw, Mich.
Super Tool Co., 21650 Hoover Rd., Detroit 13,
Mich.
Union Twist Drill Co., Athol. Mass.

TOOLS, Lathe, Shaper and Planer

TOOLS, Lathe, Shaper and Planer

Allegheny Ludium Steel Corp., Pittsburgh, Pa. Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.

Bullard Co., Brewster St., Bridgeport 2, Conn. Carboloy Dept., General Electric Co., Box 237, Roossavelt Park Annex, Detroit 32, Mich.

Firth-Sterling Inc., McKeesport, Pa.

Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.

Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.

Kennametal, Inc., Latrobe, Pa.

Lovejoy Tool Co., Inc., Springfield, Vt.

Northwestern Tool & Engrg. Co., 117 Hollier, Dayton, Ohio.

Super Tool Co., 21650 Hoover Road, Detroit 13.

Microel & Swasey Co., 5701 Carnegie Ave. Dayton, Cristians, Super Tool Co., 21650 Hoover Roau, Super Tool Co., 21650 Hoover Roau, Super Tool Co., Super Tool Carnegie Ave., Cleveland 3, Ohio.

Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

TRANSFER MACHINES, Automotic

Barnes, W. F. & John, Co., 201 S. Water St., Rockford, III. Colonial Broach Co., Detroit 13, Mich. Cross Co., 3250 Bellevue Ave., Detroit 7, Mich. Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich. Sundstrand Mch. Tool Co., 2531 11th St., Rockford, III.

TRANSFORMERS

General Electric Co., Schenectady, N. Y.

TRANSMISSION, Variable Speed

Reliance Elec. & Engrg. Co., Collinwood Station, 1088 Ivanhoe Rd., Cleveland, Ohio. Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

TUBE FLANGING MACHINES

Grant Mfg. & Mch. Co., 90 Silliman St., Bridge-port 5, Conn.

TUBE FORMING AND WELDING MACHINES

American Elec. Fusion Corp., 2606 Diversey Ave., W., Chicago, III. Yoder Co., 550 Walworth Ave., Cleveland, Ohio.

TUBE TESTING AND EXPANDING MACHINES

Hydropress, Inc., 350 Fifth Ave., New York 1, N. Y.

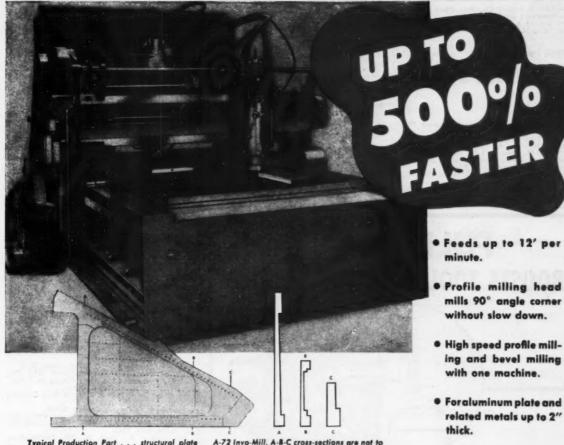
TUBING, Aluminum

Aluminum Co. of America, Oliver Bldg., Pitts-burgh, Pa.

TUBING, Bress and Copper

American Brass Co., 25 Broadway, New York, (Continued on page 394)





Typical Production Part . . . structural plate 3/6" thick, tapered from end to end. Face of part shown is relieved to four different planes. All work except drilling is performed on the

A-72 Invo-Mill. A-8-C cross-sections are not to scale . . . thickness is exaggerated for step comparison.

For the profile milling or beveling of aluminum plate, the Onsrud A-72 Invo-Mill gives unequalled production speed and accuracy. In aircraft manufacturing, parts such as integrally stiffened wing panels, rib sections, and contoured frame members are now produced in one-quarter to one-fifth the time required before. Unusual design of the profile

milling head assembly gives power feed in any direction in a horizontal plane... under direct profile bar or pattern control. Corners may be turned, or contours followed without slow down of feed. Beveling head mills any angle required in work... to a surface precision measured in micro-inches. For aluminum sheet or plate stock up to 2" thick.

For complete information write for Bulletin 1140

ONSRUD MACHINE WORKS, INC. 2940 PALMER STREET

BEVEL MILLING

For face milling sheets or plate stock in a horizontal or angular plane.





PROFILE MILLING HEAD

Power feed head travel in ANY direction over table. Range is infinite under profile pattern control.

Chase Brass & Copper Co., Inc., 1949 Rodney St., Waterbury 20, Conn. Revere Copper & Brass Inc., 230 Park Ave., New York, N. Y.

TUBING, Flexible

American Metal Hose Br. American Brass Co., 25 Broadway, New York, N. Y. Tittlex, Inc., 500 Frelinghuysen Ave., Newark 5, N. J.

TUBING, Steel

Allegheny Ludium Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Frasse, Peter A., & Co., Inc. (Seamless),
17 Grand St., New York 13, N. Y.
Republic Steel Corp., Steel & Tubes Div., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St.,
Chicago 18, Ill.
Solar Steel Corp., Union Commerce Bldg.,
Cleveland, Ohio.

Timken Roller Bearing Co., Canton, Ohio. U. S. Steel Corp., National Tube Co. Div., 436 7th Ave., Pittsburgh, Pa.

TWIST DRILLS

See Drills, Twist.

UNIVERSAL JOINTS

Baush Machine Taol Co., 156 Wason Ave., Springfield 7, Mass. Boston Gear Works, 3200 Main St., North Quincy 71, Mass.

VALVE CONTROLS

Philadelphia Gear Works (Motorized), Erie Ave., and G St., Philadelphia, Pa.

VALVES, Air

Hanna Engineering Works, 1752 Elston Ave., Chicago, III.

Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Hin.

Hunt, C. B., & Son, Inc., 1911 E. Pershing St., Solem, Ohio.

Mead Specialties Co., 4174 North Knox Ave., Chicago 41, III.

Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.

Ross Operating Valve Co., 120 E. Golden Gate, Detroit, Mich.

VALVES, Hydraulic

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincin-nati, Ohio. Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa. Barnes, John S., Corp., Rockford, III. Denison Engrg. Co., 1160 Dublin St., Columbus 16, Ohio. Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, 16, Ohio.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, III.
Hunt, C. B., & Son, Inc., 1911 E. Pershing St., Salem, Ohio.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Hydropress, Inc., 350 Fifth Ave., New York 1, New York 1, New York 1, New York Marking Co., Inc., Longerport, Inc. N. Y. Logansport Machine Co., Inc., Logansport, Ind. Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass. Sundstrand Mch. Tool Co., 2531 11th St., Rockford, III. Watson-Stillman Co., Aldene Rd., Roselie, N. J.

VIBRATION INSULATION

American Felt Co., Glenville, Conn.

VISES, Machine

Armstrong-Blum Mfg. Co., 5700 W. Blooming-dale Ave., Chicago, Ill.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.,
Delta Power Tool Div., Rockwell Mfg. Co.,
614G N. Lexington Ave., Pittsburgh & Pa.
Fenn Mfg. Co., Hartford, Con.,
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago,
Ill.

III.
Hendey Mch. Co., Torrington, Conn.
Logansport Machine Co., Inc., Logansport, Ind.
Martin, J. E. Mch. Works, 548 W. State St.,
Springfield, Ohio.
Neise, Karl A., Dept. M, 381 Fourth Ave.,
New York 16, N. Y.
Producto Mch. Co., 990 Housatonic Ave.,
Bridgeport, Conn.
Skinner Chuck Co., 344 Church St., New Britain,
Conn.

VISES, Pipe

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, III, Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

VISES, Planer and Shaper

Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Shaper Co., Elam and Garrard Aves.,
Cincinnati, Ohio.
Martin, J. E., Mch. Works, 548 W. State St.,
Springfield, Ohio.
Rockford Mch. Tool Co., 2500 Kishwaukee St.,
Rockford, III.
Skinner Chuck Co., 344 Church St., New Britain,
Conn.

VISES, Pneumatic

Mead Specialties Co., 4114 North Knox Ave., Chicago 41, Ill.

VOLTMETERS

Bristol Co., Platts Mills, Waterbury, Conn. General Electric Co., Schenectady, N. Y.

WASHERS, Lock

Eaton Mfg. Co., Reliance Div., 25 Charles Ave., S. E., Massillon, Ohio. Standard Locknut & Lockwasher, Inc., 510 N. Capitol Ave., Indianapolis, Ind.

WASHERS, Spring

Eaton Mfg. Co., Reliance Div., 25 Charles Ave., S. E., Massillon, Ohio.

(Continued on page 396)



An 8" cube may be easily handled in this SHAPE-RITE SHAPER. With an 8½" stroke, 9½" horizontal table travel, and plenty of clearance under the ram, there is no need to tie up larger shapers on smaller work in your tool room. The full 8" cut does the job fast. Precision design and con-

struction assures a job done right. The SHAPE-RITE is easy to set up and easy to operate. Write today for new SHAPE-RITE specification bulletin!

Name

O. X. Mail me your SHAPE-RITE Shaper bulletin.

Sales Service Machine Tool Co.

PRESS RITE PRESSES . SHAPE RITE SHAPERS . KELLER POWER HACK SAWS

ding British Machine Tools

60 E 42nd St., No.

FOR EASY OPERATION! HIGHEST PRODUCTION!

SMART & BROWN L-16 HAND SCREW MACHINE

FOR HIGHEST PRECISION WORK TO 11/16" Dia.



SMOOTHEST TURNED FINISH OBTAINABLE WITHOUT

Vibrationless at high speeds through independent support of cone pulley on separate ball bearings. Produces low micro inch finish, often eliminating grinding operations.



Painstaking fitting of long adjustable bronze front bearing results in certified round diameters to the closest

INSPECTION CERTIFICATE

Test Certificates are supplied with each machine showing closest tolerances. Model L lathes are consistently built to halve these standards.





BROWN IN CENTRE LATHE SERIAL N



MAIL THIS COUPON

for complimentary book, "British Machine Tools"

Valuable 48 page catalogue describing and illustrating hundreds of sutstanding machine tools.

NTERCHANGEABLE SPECIALIZED **ATTACHMENTS**

SMART & BROWN



Specifications of L-16 Hand Screw Machine

Bore of spindle	29/32	
Number of spindle speeds	6	
Range of spindle speeds	390-2290	
Maximum collet capacity	11/16	
Turret tool holes	34	
Hp of motor	34	
Net weight, lbs.	672	

DELIVERY 30 DAYS OR LESS

BRITISH INDUSTRIES CORP. Dept. M 1 | 164 Duane Street, New York 13, N. Y. Gentlemen: Please send "British Machine Tools" to

BRITISH INDUSTRIES CORP. 164 DUANE STREET

WELDING AND CUTTING EQUIPMENT Oxyacetylens

Air Reduction Sales Co., 60 E. 42nd St., New York, N. Y. Linde Air Products Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.

WELDING AND CUTTING GAGES

Air Reduction Sales Co., 60 E. 42nd St., New York, N. Y. Linde Air Products Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.

WELDING EQUIPMENT, Electric Arc

Air Reduction Sales Co., 60 E. 42nd St., New York, N. Y. Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.

General Electric Co., Schenectady, N. Y. Lincoln Electric Co., 22801 St. Clair Ave., Cleveland, Ohio.

WELDING EQUIPMENT, Electric, Spot, Butt, Soom, Etc.

American Electric Fusion Corp., 2606 Diversey Ave., W., Chicago, III.
Deita Power Tool Div., Rockweil Mfg. Co., 6146 N. Lexington Ave., Pittsburgh 8, Pa.
DoAll Co., 254 Laurel Ave., Des Plaines, III.

WELDING POSITIONER

Johnson Machine Works, 617 Menomonie St., Eau Claire, Wis.

WELDMENTS

Mahon, R. C., Co., Detroit 34, Mich. Woods, A. C., & Co., Div. Kropp Forge Co., 1129 Harrison Ave., Rockford, Ill.

gate DIVERSIMATIC'S possibilities on

Full line of INFEEDING, THRU-

FEEDING, AUTOMATIC CYCLING.

Just 8 weeks away—why wait?

METAL PRODUCTS CO. 5125 Alcon Avenue, Los Angeles SB, Calif.

your work! ACCESSORIES:

DELIVERY:

DIVERSIFIED

WIRE

American Steel & Wire Co., Div. U. S. Steel Corp., Rockefeller Bldg., Cleveland, Ohio. Bethlehem Steel Co., Bethlehem, Pa. Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio. U. S. Steel Corp. (American Steel & Wire Co. Div., Columbia Steel Co. Div., Tennassee Coal, Iron & R. R. Co. Div.), 436 7th Ava., Pittsburgh, Pa.

WIRE FORMING MACHINERY

Nilson, A. H., Mch. Co., 1506 Railroad Ave., Bridgeport, Conn. U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

WIRE NAIL MACHINERY

Bliss, E. W., Co., 1375 Raff Rd., S. W., Canton, National Mchry. Co., Greenfield and Stanton Sts., Tiffin, Ohio. Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.

WOODWORKING MACHINERY

Delta Power Taol Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh & Pa. Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa. Greenlee Bros. & Co., 12th and Columbia Aves., Rockford, Ill.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.
Walker-Turner Div., Kearney & Trecker Corp., South Ave., Plainfield, N. J.

WORM DRIVES

Cleveland Worm & Gear Co., 3249 E. 80th St., Cleveland, Ohio. Cone-Drive Gear Div., Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich. Ohio Gear Co., 1333 E. 179th St., Cleveland, Ohio. Philadelphia Gear Works, Erie Ave. and G St., Philadelphia, Pa.

WRENCHES

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, III. Ingersoll-Rand Co. (Impact, Pneumatic, Elec-tric), Phillipsburg, N. J. Standard Tool Co., 3950 Chester Ave., Cleve-land, Ohio. Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

WRENCHES, Detachable Socket.

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Iil. Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

WRENCHES, Pipe

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, III.

WRENCHES, Ratchet

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, III. Williams, J. H., & Co., 400 Vulcan St., Buffelo 7, N. Y.

WRENCHES, Top

Butterfield Div., Union Twist Drill Co., Derby Line, Vt. Card, S. W., Mfg. Co., Div. Union Twist Drill Co., Mansfield, Mass. Greenfield Tap & Die Corp., Greenfield, Mass. Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney, West Hartford 1, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.

WRENCHES, Torque Measuring

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, III. Sturtevant, P. A., Co., Addison, III. Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.



ASK FOR THIS

NEW FOLDER

6 pages of detailed

centerless grinder

information.

Sent free.

Kodak Conju-Gage Gear Checkers deliver

A fundamental improvement in quality control of gearing

RESULTS—toolroom precision... versatility...fast checking... no questionable rejection losses

Gear manufacturers and engineers are meeting the requirements for increased production of tighter and tighter tolerance gears with improved precision manufacturing equipment. Invaluable in quickly checking and controlling the quality of this tight-tolerance production are Kodak Conju-Gage Gear Checkers.

The fundamental principle around which Kodak Conju-Gage Gear Checkers are designed is a new kind of gaging element—the Kodak Conju-Gage Worm Section—inherently simple and accurate in form—made to tolerances almost impossible to obtain in circular master gears, especially in finer pitches.

A single Kodak Conju-Gage Worm Section of given normal pitch and pressure angle checks any corresponding spur or helical gear of any helix angle. It checks the composite effect of runout, base pitch error, tooth thickness variation, profile error, and lateral runout, as recommended in the new American Standard.* Lead error, crown, and taper can also be checked and applied to standard quality control inspection procedures.



Kodak Conju-Gage Gear Checker, Model 4U, tests gears up to 4½" pitch diameter. Automatically writes records to ship with gears or to hold for reference. Larger and smaller models are also available.

Anyone interested in the fundamental improvement of quality control of gearing will find the booklet, "Kodak Conju-Gage Gear Testing Principle," extremely helpful. It's yours for the asking. Eastman Kodak Company, Industrial Optical Sales Division, Rochester 4, N. Y.

To inspect all kinds of complex parts on a bright screen, Kodak also makes two highly versatile contour projectors.

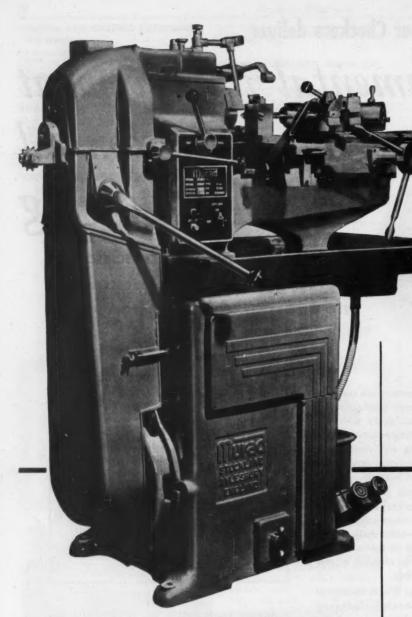
CONJU-GAGE



INSTRUMENTATION

...a new way to check gear precision in action

Kodak



form cuts. * SWINGING STOP

The only turret lathe with a swinging stop giving an extra turret tool position.

High spindle speeds with elimination of all vibration. Instant reversing possible because of cushioned drive. TUNUSUALLY LARGE SPINDLE With its Hyper-Precision preloaded bearings allow wide

MASSIVE BED

With special positioning of box type ribs giving rigidity and maintained accuracy.

ROBUST CROSS SLIDE

* VIBRATION-FREE DRIVE

Massive adjustable screw operated cross slide with Murad micrometer adjustable back tool slide.

* CONVENIENT CONTROLS

Come easily to the hand at the natural height for fast and easy operation.

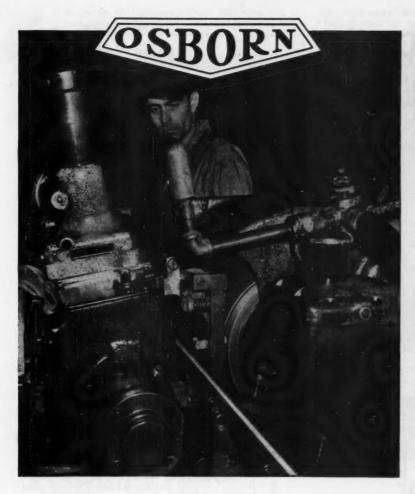
* SPEEDY FOOT CONTROL

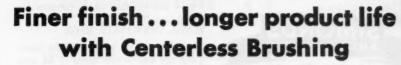
A choice of spindle speeds in the ratio of 1 to 4 instantly available by pedal control.

ram type turret lathe

Designed and built for increased and improved production, the MURAD ram type turret lathe has a proven record which more than justifies all the claims put forward on its behalf. Special features of design make it unexcelled anywhere for production capacity, accuracy and operative convenience.

MURAD DEVELOPMENTS LIMITED, AYLESBURY, BUCKS, ENGLAND





This working does double duty. For removal of metal to close tolerance, it is a centerless grinder. Then, for finishing the surface to microsmoothness it is a centerless brusher. Its conversion takes only a few minutes.

In the operation shown above, nickel-moly steel rods for pumps, are being finished by an Osborn Fascut Brush. Prior to brushing, the same machine with a grinding wheel in place of the brush made a rough grind, taking off .006 inch, and a finish grind, taking off .002 inch. Results of the Centerless Brushing: Produces a smoother finish. Reduces wear in pump packing. Reduces corrosive action on rods; makes them last longer.

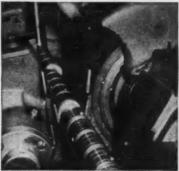
An Osborn Brushing Analyst helped develop this improvement. Ask your OBA to help you on all problems of cleaning and finishing! Call him today or write The Osborn Manufacturing Company, Dept. 864, 5401 Hamilton Avenue, Cleveland 14, Ohio.



OSBORN POWER, MAINTENANCE AND PAINT BRUSHES AND FOUNDRY MOLDING MACHINES



THE SET-UP. This shows the centerless grinding machine which also serves as a "centerless brusher". These pump rods vary from 1½ in. to 1½ in. diameter . . . from 6 ft. to 36 ft. in length. Regulating wheel speed is 52 r.p.m.



ANOTHER JOB. Here Centerless Brushing finishes cast iron pistons to microsmoothness. Simplifies assembly operations and increases life of pistons and cylinders. Output of this machine is 10,000 pieces per 8 hours.



TYPICAL PARTS which are being improved by Centerless Brushing include pistons, piston pins, bushings, tubing . . . any cylindrical parts. It can be applied to many sizes of parts and types of material on a mass production basis.

Arctic Seals and Grinding Wheels have something in common

You wouldn't think there was any similarity between the gnawing action of a seal's teeth and the cutting action of a grinding wheel. Actually there is. Let's consider the Arctic seal, for instance. Though not a rodent, it has rat-like teeth that keep growing up from the roots to stay the same length. Why does the seal need any such provision? Here's why.

The arctic basin is covered by a huge raft of ice about seven feet thick under which the seal swims about after fish rising for air now and then into one of his cigar-shaped breathing holes. The floe cracks often, leaving a strip of open water upon which the seals frisk about, greeting old and making new acquaintances.

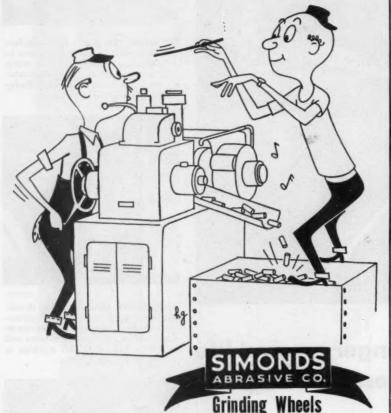
But this doesn't last long. Ice begins to form, saltwater ice, which is strangely tough and elastic but even up to a thickness of four inches will yield to a sharp blow. The seals start fishing again and when they need air they rise up fast under the new ice and just bunt a hole.

When the ice is too thick for bunting the seal settles down in an area of a couple of acres, keeping six or seven holes open by diligent gnawing from beneath. That's his home and his hunting range until the next big crack opens up.

Between the seal's incisors and the modern grinding wheels there is an interesting parallel. Nature renews the seal's cutting edge but that of the wheel is a clever arrangement contrived by man. As the cutting element dulls the pressure on it rises, pulls it loose and presents a new sharp edge. After it has worn away to the point of losing its grip in the matrix it falls out and lo, just behind it is yet another new cutting edge which instantly takes over the job.

Nature is wonderful, but Man doesn't do too bad.







Keep your production line humming. Get in tune for maximum output with Simonds Abrasive Co. grinding wheels.

You will find plenty of satisfaction, savings and serviceability in these accurately specified production tools. Right now they're proving their adaptability, efficiency and economy in every phase of industrial grinding from production snagging to micro-inch finishing. Complete line includes grinding wheels, mounted wheels and points, segments and abrasive grain.

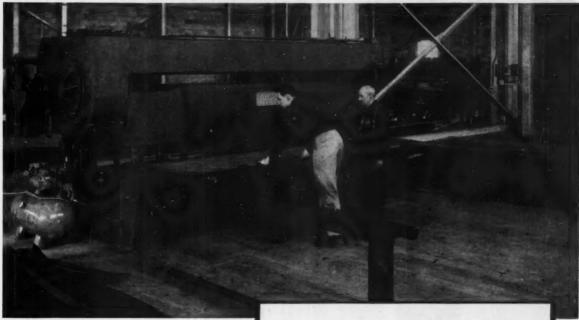
Write for free data book and name of your Simonds distributor.

SIMONDS ABRASIVE CO. PHILADELPHIA 37" PA. BRANCH WAVEHOUSES CHICAGO, DETROIT, NOSTON

Division of Simonds Saw and Steel Co., Fitchburg, Mass. Other Simonds Companies: Simonds Steel Mills, Lockport, N. Y., Simonds Canada Saw Co., Ltd., Montreal, Que. and Simonds Canada Abrasive Co., Ltd., Arvida, Que.

Series No. 4B12 Steelweld Shear. With more than a half century of experience in steel warehousing, Enos & Sanderson know what good shearing is.

They are proud of this machine. They advertise that: "Trained shearing teams will give you the finest edge ever cut with this Steelweld".



"NEVER SEEN A SMOOTHER OPERATING SHEAR"

Steel Warehouse Elated with Steelweld Shear

 \mathbf{F} or 57 years The Enos & Sanderson Company, Buffalo, N. Y. has been supplying steel sheets and plates to hundreds of Niagara Frontier factories. Recently they installed a Steelweld Shear in their new warehouse. This is used for cutting various thicknesses to 1/4" x 12', as per customer orders. Cuts must be smooth, straight and accurate. Speed is essential to provide best service possible.

Enos & Sanderson's new 35,000 sq. ft. steel warehouse

The following paragraph in an unsolicited letter from Enos & Sanderson indicates how well their Steel-

weld Shear is serving their needs:

"We are extremely satisfied with the operation of this unit and would recommend this machine highly to anyone. A rigger, who set up this shear for operation, remarked that, in his twenty-five years of work with shears of all types, he had never seen a smoother operating shear in his experience."



GET THIS BOOK!

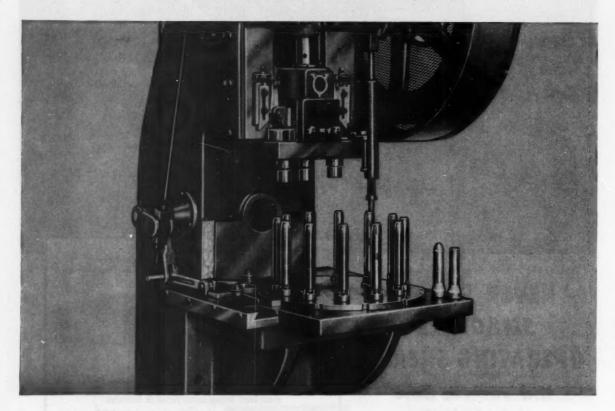
CATALOG No. 2011 gives construction and engineering details. Profusely illustrated, THE CLEVELAND CRANE & ENGINEERING CO.

5435 EAST 282nd ST.

WICKLIFFE, OHIO

STEELWELD PINOTED SHEARS

300% More Production Per Press with V&O Dial Feed



This Production Increase was obtained by the Blake Manufacturing Company, Clinton, Mass., on a pointing operation on flashlight cases. Under the old method, Blake employed two presses and two operators for this job. Pieces completed by the two men averaged 32 per minute, or 16 per man. With the V & O Dial Feed, one man operating one press produces 48 per minute, for an increase of 300% in per press production. It was also possible to add a third operation to improve the finish of the case and reduce rejects.

The Dial Feed designed and built for this manufacturer is typical of the tooling available at V & O. More and more manufacturers have come to realize that automatic feeds of the dial type boost production rates, conserve manpower and greatly simplify operator motions. V & O does the complete job for you on Dial Feeds, from initial design through manufacture. You get a complete package.

Only the best is good enough



DESCRIPTIVE CATALOGS Catalogs containing complete specifications and operating details on V & O Precision Power Presses and Feeds are available. Please write The V & O Press Company, 341 Union Turnpike, Hudson, N. Y.



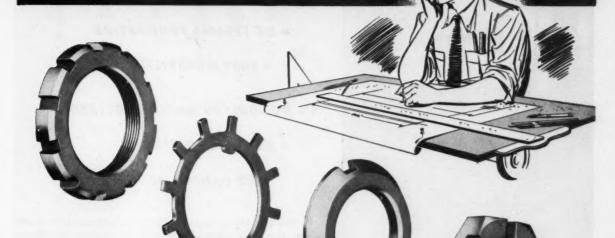
THE V & O PRESS COMPANY

Division of Embart Mfg. Co.
BUILDERS OF PRECISION POWER PRESSES
AND FEEDS SINCE 1889

HUDSON

NEW YORK

SPECIAL APPLICATION PROBLEM?



• Send us your specifications and let us quote for you. Standard's long experience assures reliable workmanship for the most unusual requirements.

Regardless whether the application is large or small, Standard can give you the long-life, trouble-free solution. Standard locknuts and lockwashers have a well-deserved reputation for the rugged endurance and precise locking that are vitally essential to long, efficient bearing assembly life.

Naturally, call on Standard for regular S.A.E. sizes of locknuts and lockwashers, too.

Write today for Standard's detailed Bulletin No. 30





Locknut and Lockwasher, Inc.

from 1/2 to 100 hp

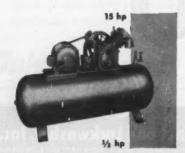
I-R AIR-COOLED COMPRESSORS

give you these important advantages



This 50-horsepower V-belt driven Type 40 compressor supplies air in an abrasive-manufacturing plant.





. SMALL FLOOR SPACE

- . NO SPECIAL FOUNDATION
 - . EASY MOVABILITY
- . NO COOLING WATER REQUIRED
 - . NO WATER PIPING
 - . NO DANGER OF FREEZING
- Wherever compactness and light weight, low installation and operating costs, dependable service, and minimum attendance are important factors, Ingersoll-Rand air-cooled compressors fill all the requirements.

Their wide acceptance by all types of industry—from mines to power plants—from drug manufacturers to cargo ships—proves their versatility and dependability. For main air supply, for supplementing the capacity of larger compressors or for de-centralized air systems, Type 30 and Type 40 compressors are ideal. Your nearest I-R representative will be happy to apply his knowledge and experience to your particular problem.

Type 40 Compressors are two-stage, air-cooled . . . sizes from 25 to 100 hp. Discharge pressures from 80 to 125 psi, also up to 200 psi. . . . Three types of drive: "Motor-compressor," with built-in electric motor; flexible coupled; or V-belt driven. Durable, efficient Channel Valves, Timken tapered-roller main bearings and Constant-level lubrication are additional features. Dual-Control permits selection of constant speed or automatic-start-and-stop control.

Type 30 Compressors come in sizes from ½ to 15 hp... handle smaller volumes of air at pressures from 5 to 3500 psi. Available as complete receiver mounted units, with base-plate mountings, or as bare compressor units. Can be equipped with automatic-start-and-stop control, constant-speed control, or dual-control to permit selection of either type. For special service such as instrument control or agitation, certain sizes are available with non-lubricated cylinders.

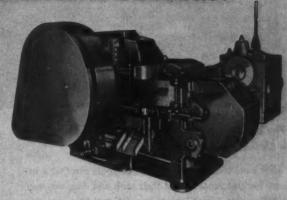
Ingersoll-Rand

PUMPS . CONDENSERS . AIR AND BLECTRIC TOOLS . ROCK DRILLS

COLD-FORGE YOUR "GADGETS" ON NATIONAL PROGRESSIVE HEADERS!

Multi-Station Machine Produces Close-Tolerance Parts Seven to Fifteen Times Faster Than Machining Methods...Reduces Material Waste Up to 50%....

National Progressive-Type Headers are considered "The Gadget-Makers of Cold-Forging" because their range includes a wide variety of odd-shaped metal parts. In the Progressive Header Method, the blank is cut off and progressively transferred through two or more sets of punches and dies, producing work previously considered too complex for high-speed cold-forging.



If your work involves double and triple extrusion—or multiple heading in two or more die impressions—then it is especially suited to the National Progressive Header Method.



THIS DOOR IS ALWAYS OPEN

Let us help you apply National's experience in hot and cold forging to your jobs. Send us prints or samples of your work, or better yet, pay us a visit. No obligation.

MATIONAL MACHINERY COMPANY

DESIGNERS AND BUILDERS OF MODERN FORGING MACHINES-MAXIPRESSES-COLD HEADERS-AND BOLT, NUT, RIVET, AND WIRE NAIL MACHINERY

Hartford

Detroit

Chicago



If You are Responsible for Tooling and Production, Accept this Challenge and Get Results!

If other men with responsibilities like yours can find a new source for cost economies in their tools and dies, why can't you? By taking a fresh look at this vital cost zone, one plant now makes far fewer dies each year to do the same jobs. Another has been able to lengthen die life between grinds so that costly machine downtime is no longer a problem. Still another reports that expensive die finishing and adjusting are being held to a minimum.

Another good example is the job shown above. These tools notch different shapes in materials ranging from ½" thick c.r. steel to ¼" diamond plate. A re-check of the dies showed that a steel with more toughness was needed, and Carpenter R.D.S. (Oil-Tough) was put to work. Now, where the "old" tools chipped badly and required frequent regrinding of as much as .031" off the surface, the R.D.S. tools hold up day

after day with only occasional sharpening. And when sharpening is required, the toolroom has to remove only .010"/.015".

To re-check your cost relief zone, use The Carpenter Matched Set Method to select the one steel best suited to cut costs. This method is backed by strictly dependable tool and die steels that stay on the job. For rush delivery, call your nearest Carpenter Mill-Branch Warehouse or Distributor. THE CARPENTER STEEL COMPANY, 105 W. BERN ST., READING, PA.

Are You Missing These Opportunities In Your Cost Relief Zone?

- Less die finishing and adjusting
- Greater output between grinds
- ·Fewer heat treating failures
- Less machine downtime

On Job After Job Carpenter Matched Tool and Die Steels Have Made Them Possible!

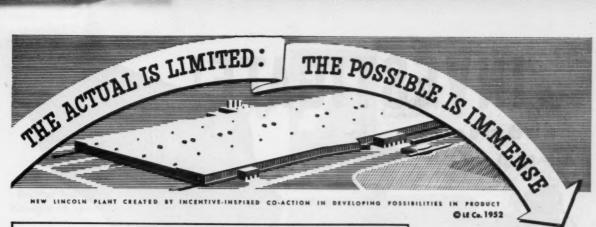




Export Department: The Carpenter Steel Co., Port Washington, N. Y.—"CARSTEELCO"

Mill-Branch Warehouses and Distributors in Principal Cities Throughout the U.S. A. and Canada

406-MACHINERY, November, 1952



WELDED DESIGN SAVES 25% ON COST

... cuts weight 26%

By B. L. Kapp, Plant Manager & Chief Engineer

Indianapolis, Indiana Corson Brothers, Inc.

TELDED design enables us to make the most efficient use of materials in the manufacture of our "Seedmaster". Formerly it was necessary to example, weight was cut from 23 to 17 pounds. Since use heavy wall sections with gray iron because of casting restrictions. With steel we now fabricate a more rigid, more dependable product using metals as light as 12 gauge. On this one machine, for welded steel is easier to fabricate, our shop costs have been lowered by 25%. Former field service

In addition to components shown in Figures 1 and the main frame was also converted to welded steel. In place of a solid cast rectangular member, the main frame is now formed from 12 gauge steel with rolled edges for rigidity. The steel design is easier to assemble and has greater sales appeal. problems of breakage have been eliminated.

elded Steel Design Fig. 4. Present Welded Steel Desi Steel members replace cast co ponents, prove to be lighter,

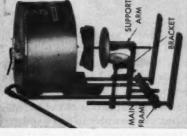


Fig. 3. Original Construction of Seedmaster, frame built by Corson Brothers, Inc. Weighed 23 pounds, was subject to fracture.

PROPER DESIGN IN WELDED STEEL IMPROVES PRODUCT LOWERS COST



Fig. 1. Former Design of bracket was gray iron . . . is now fabricated from 12 gauge steel. Steel design is rugged, durable, will

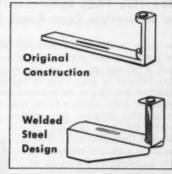


Fig. 2. Support Arm originally a casting, required costly milling and drilling. Wall section was 14. Is now formed from 12 gauge material, bas greater strength, increased rigidity, less weight.

SAVES MATERIAL LOWERS COST

INCOLN ELECTRIC COMPANY

CLEVELAND 17, OHIO

THE WORLD'S LARGEST MANUFACTURER OF ARC WELDING EQUIPMENT

INVESTIGATEL







Use this FREE Laboratory Service to determine Your Exact Needs . . .

In order to determine whether lapping would be practical and profitable for you, we maintain a laboratory for lapping sample parts. If you believe it may offer possibilities in your plant we invite you to send prints of the parts, together with surface finish requirements and production desired. In addition send several parts for test lapping in our laboratories.

We can then give you the facts on what you can expect from the Lapmaster. There is no obligation for this service.

ADDITIONAL DATA ...

on the complete line of Lapmasters is available on request. Write for your copy today. Ask for bulletin M-11.



high production on Lap master. Left, Model 12 Lapmaster in operation. Other machines available in complete range of sizes.

Above, parts lapped at

If You Want PRECISION FLATNESS, FINISH and PARALLELITY in PRODUCTION QUANTITIES

A manufacturer of hardened high carbon steel valves required parts lapped to a degree of flatness for withstanding 2000 P. S. I. air pressure with no leakage. The part shown above is $\frac{3}{8}$ " in diameter and $\frac{1}{16}$ " thick. It is precision lapped on each side with the Lapmaster 12" at the rate of 195 pieces per 5 minute lapping cycle per side.

Prior to his investigation of the Lapmaster, the manufacturer had not been able to find a satisfactory method of lapping these valve parts. He reported that he would have been unable to make this valve to its existing design without the Lapmaster. The economies of production it afforded made it possible for him to produce the valve at a marketable cost.

Consistent Flatness of 1 Light Band Opens Possibilities for Product Improvement

Manufacturers of pumps, compressors, and equipment containing liquids or air under high pressures have found it possible to eliminate gaskets in mating surfaces because of the extreme accuracy of work produced by the Lapmaster. Quality of surface (RMS) is controlled by Lapmaster compounds. Micro-inch finishes of 2 to 3 RMS are common. Surface flatness can also be held to less than one light band or .0000116". (11.6 millionths of an inch.)



Lodge & Shipley 60" Lathes in 6 distinctive models

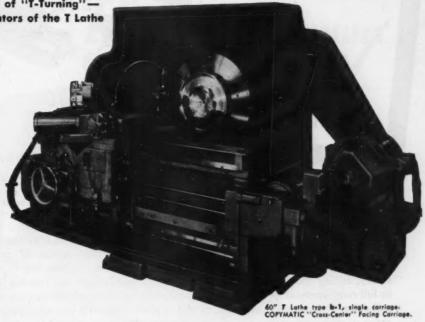
Further advances in the art of "T-Turning" brought to you by the originators of the T Lathe

Developed as a result of the experiences and needs of jet engine manufacturers and others, these latest type Lodge & Shipley T Lathes offer even greater speed, accuracy and ease of machining.

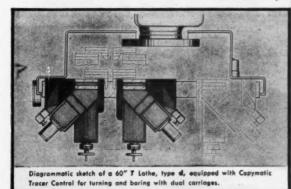
These lathes have one or two carriages, either or both of which may be COPYMATIC controlled for automatic contour turning, facing and boring of short, thinwalled section work of large diameter. The new carriage arrangements further advance the art of "T-Turning."

Basically, the T Lathe costs less than conventional machines, saves 50% or more in floor space, obsoletes the use of large cumbersome engine and raised lathes for this type of work.

Write for complete information and new T Lathe literature.



Choose a Lodge & Shipley T Lathe designed for short, thin wall large diameter work



Lodge & Shipley

MACHINE TOOL DIVISION • 3063 COLERAIN CHOREMASTER DIVISION • 800 EVANS ST. CINCINNATI 25, OHIO

*T. M. The Lodge & Shipley Co.

for straight and angular facing, turn-Type C = ing, boring b-1 for contour facing on both sides of center . . . limited contour turning and boring for contour turning, boring; straight d facing and limited contour facing for contour turning; straight and an-Type @ gular facing, turning, boring for straight and angular facing, turning, boring for straight and angular facing, turnm ing, boring and contour boring

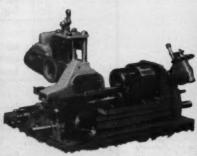


The Master attachment can be used profitably on many production operations. Mount it on your present equipment, lathes, turrets, mills, or use independently to perform additional operations in the same set-up. The basic milling unit with the above types of precision heads gives you facilities for milling, grinding, boring, drilling, indexing, slotting, and keyseating, both internal and external. Therefore, the Master with its full complement of equipment is an outstanding value for general purpose use in maintenance, repair, tool room, and experimental shops, as well as production, thus providing equipment that performs a full range of shop operations at a minimum investment. These improved models of Master attachments are outstanding in rigidity, capacity, and simplicity of set-up and operation and incorporate the latest features developed in our seventeen years of manufacturing this tool. Investigate this valuable shop tool. For the cost of one single-purpose machine, you can have several Master units producing. Prompt deliveries.

MAKES LOW-COST INDEPENDENT PRODUCTION SET-UPS-PORTABLE-SELF-POWERED



End Milling 21/2" keyway in 97/2" diameter



Master portable keyseating and slotting hea cutting internal splines on bench set-up.



Special portable milling machine made from standard Master components, variable post



FREE

WRITE FOR NEW ILLUSTRATED 24-PAGE CATALOG

MASTER MANUFACTURING CO

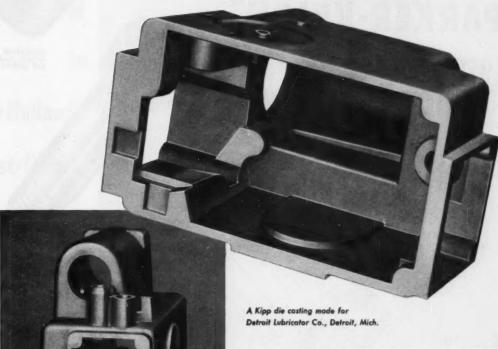
304 EAST AVENUE A . HUTCHINSON, KANSAS, U.S.A.

DESIGNING

for multiple profits with

MADISON-KIPP

ZINC AND ALUMINUM DIE CASTINGS



madison Kipp corporation Just one glance at the instrument housing, here illustrated, will convince you that seasoned designing is involved—both primary and secondary—by the principal and by the die caster.

There are core pulls from five out of six sides. The tapers are ideal for aluminum. The wall sections are the lightest practicable for function. Minimum machining is required. In combination these features result in multiple returns—to the original equipment maker, the manufacturer of the product using the instrument and the ultimate user.

You can believe such established proofs and you can probably apply Madison-Kipp die castings to advantage in your new parts or those you expect to redesign. Please send your inquiries to our home office in Madison, Wisconsin.

MADISON - KIPP CORPORATION 203 WAUBESA STREET . MADISON 10, WIS., U.S.A.

• Skilled in Die Casting Mechanics • Experienced in Lubrication Engineering • Originators of Really High Speed Air Tools

MACHINERY, November, 1952-411



FERRACUTE STRAIGHT SIDED DOUBLE CRANK PRESS No. SGGF—8½ 90 With one of the pieces it shapes at New Holland in two strikes, two at a time.

BIG
GUN
in
New Holland's
Cost-Cutting
Program



From scratch in 1941 to one of the top producers in the field of farm machinery is the success story of New Holland Machine Co., New Holland, Pa. After a fast decade of expansion New Holland is now engaged in a cost-cutting program. Many operations have been speeded up and much fabrica-

tion that was formerly sent out is now being done in the New Holland plants. FERRA-CUTE STRAIGHT SIDED DOUBLE CRANK PRESS NO. SGGF — 8½ 90 is the biggest and one of the newest presses in this program. Other FERRACUTE units play key roles in New Holland's production—as they have done for 89 years in so many important U. S. industries. Consider FERRACUTE to improve your own profit picture. We'll be glad to discuss your plans.



MACHINE COMPANY

Manufacturers of Power Presses and Special Machinery • BRIDGETON, N. J., U. S. A.



TOOLS

TURNING TOOL . TAP AND DIE NOLDER . UNIVERSAL TOOL POST . TURRET BACKREST HOLDER . CUT-OFF BLADE NOLDER . RECESSING TOOL RELEASING ACORN DIE NOLDER . REVOLVING STOCK STOP . FLOATING DRILL HOLDER . KNURLING TOOL . CARBIDE AND ROLLER BACKRESTS



Four-Point Press, 850 Tons Capacity

BIG... PERFORMANCE TOO!

Certainly when you buy a press you want one large enough with the necessary capacity to handle assigned jobs, but don't stop there—size isn't everything. Be sure that you get a press whose frame is designed to "take it" under the strain of continuous operation and occasional overload; a press with long enough gibbing to assure slide accuracy and protect die-life. Get a press equipped with a clutch that offers positive control, requires only occasional, easy-to-make adjustments and is economical to operate. In other words—get a CLEVELAND!

PUNCHING TOOLS & DIES

PUNCH & SHEAR WORKS CO.

CLEVELAND 14, ONIO

DETROIT... PHILADELENIA

E. LAMING

How plant engineers
make present machines safer
and more automatic
by installing MICRO
PRECISION SWITCHES

Here are typical installations of MICRO precision switches by plant engineers on present plant equipment to make machines safer, more automatic and more exactly suited to their production needs.

Machines so equipped often pay big dividends in increased production. The MICRO line of precise snap-action switches for economical modernization of existing plant equipment includes a wide variety of ruggedly-housed switches for use as limits, safeties and interlocks.



Prevents punch press from operation unless inching bar is removed

This MICRO die-cast enclosed switch is used to protect the operator of a punch press by preventing the machine from starting when the hinged guard is opened for insertion of the inching bar, used in setting up dies. The switch is wired to the power supply ahead of the on-off switch. When guard is opened, power to machine is automatically cut off.



Keeps screw machine shut off while operator feeds new stock

This MICRO roller-arm-actuated die-cast enclosed switch increases operator safety and prevents damage to a screw machine. The switch is wired into the power circuit ahead of on-off switch. It automatically shuts off the machine when either the bar support tube or spindle cover is moved to an open position.

Surface grinder won't operate unless magnetic chuck is turned on

This MICRO sealed die-cast switch prevents damage to surface grinder or stock and increases safety of operator. Arm installed on the shaft turns on the permanent magnet chuck which holds the stock in place. Driving motors cannot be started unless chuck is turned on.

MICRO distributors are located in over a hundred key cities to supply just the right switch to meet your plant application need. Look for your nearest distributor in your classified telephone book under "Switches, Electric."

MICRO

A DIVISION OF

MINNEAPOLIS-HONEYWELL REGULATOR COMPANY

FREEPORT, ILLINOIS =



new MULTIPRESS®

touch control"

RAM MOVEMENT AND
PRESSURE RESPOND
INSTANTLY—IN DIRECT
PROPORTION TO THE WAY
YOU MOVE OR PRESS DOWN
ON THIS HAND LEVER

PERFECT RAM CONTROL
IN THE PALM OF YOUR HAND

Now you can have all the operating advantages of Multipress plus quick, sure, directaction "Touch Control". The slightest movement of this "slave-type" control is converted instantly and directly into ram movement . . the ram starts, stops, reverses, speeds up, slows down, or exerts pressure in exact, split-second relation to every move of the hand lever. Every added ounce of pressure on the lever is instantly multiplied into added ram effort—in an exact ratio. It is as though the operator's hand and arm move the ram itself with the power of a skilled giant. Rapid-fire "jiggling" of the lever brings equivalent "vibratory" pressure applications on the work.

Pressures are quickly and accurately shown on the dial gauge. The operator can build up pressures quickly or slowly, to any predetermined need. And because ram movement and pressure are so accurately related to every movement of the hand lever, he quickly gets the "feel" of any repeated operation.

Stroke length is fully adjustable at both its upper and lower limits, and maximum tonnage



Multipress is built in eight frame sizes and in one-ton to 50-ton capacities—all available with Touch Control.

can also be preset to any pressure within the limits of the press.

With "Touch Control" the fast, smooth oilhydraulic accuracy of Multipress is made even more closely adaptable to all types of production jobs where complete control of the ram is needed, as in straightening operations. Write for full details today.

The **DENISON** Engineering Co.

1152 Dublin Road Columbus 16, Ohio

7/ DENISON

MACHINERY, November, 1952-417



Columbus Die-Tool

Get production off to a profitable start! Use Columbus Die-Tool engineered tools. Jigs, Fixtures, and Special Machinery individually designed and built to produce your product alone . . . at a rate to match your production schedule. That's production economy! That's the wisdom of CDT special machinery! That's how Columbus Die-Tool can put your production on a profitable basis. Columbus Die-Tool are specialists in building special tools, jigs, fixtures and machinery . . . have been for over 46 years. Talk over your special problems with us. Absolutely no obligation. Write today.



There's a Walker Magnetic Chuck for Every Known Application



Reliability—Strength

The Walker "Concentric Gap" Magnetic Chuck meets day-in, day-out requirements for a powerful chuck. For more than forty years, with a basic electro-magnetic circuit, the Walker "Concentric Gap" Chuck has proven itself reliable, efficient and economical.

Standard Electro and Permanent Magnetic Chucks . . . Vacuum Chucks . . . Special Applications for various holding problems . . . Demagnetizers . . . Magnetic Clutches.

Original Designers and Builders of Magnetic Chucks

O. S. WALKER CO.Inc.



HERMETICALLY-SEALED

for positive proof against

- COLD and HEAT (from -100°F. to +250°F.)

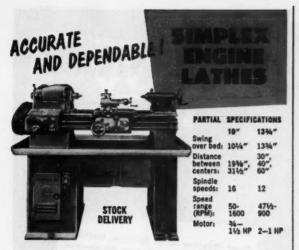
Here's a dependable limit switch that provides true Environment-Free performance. With operating parts fully sealed in an inert gas, this switch will not freeze or jam. It is impervious to moisture, oil, dirt, tampering and misadjustment.

Accuracy with Long-Life Rigid tests by users have proved that Electro-Snap Switches last longer—while retaining complete accuracy and reliability of operation... both electrically and mechanically. They are available with mountings and actuators to fit them to a broad range of uses.

Whatever your use for precision switches, get the facts on the ELECTRO-SNAP Line. Write for fres Basic Switch and Catalog.



ELECTRO-SNAP SWITCH & MFG. CO.



Years of experience and reputation in the Machine Tool field confirm the high standards of these lathes in design, materials and workmanship . . . They are rigidly constructed for high efficiency and close tolerance, and will give long-time, economical service.

The Simplex lathes come with ground lead screw, complete range of American Standard threads, quick change gear box, spline shafts, beavily constructed and well ribbed bed to guarantee minimum vibration. All measurements are in INCHES AND DECIMALS.

Write us now for complete details!





These HAYNES STELLITE alloy No. 6 bushings for ship turbine control mechanism effectively resist the severe abrasive wear to which they are subjected. HAYNES STELLITE alloy has a low co-efficient of friction and is practically impervious to atmospheric corrosion. These properties make the alloy particularly useful for applications of this type.

Many types of specially designed bushings and half bushings, as well as other special machinery parts, are available in any grade of HAYNES STELLITE alloy. Write for more complete information.

HAYNES STELLITE COMPANY

A Division of Union Carbide and Carbon Corporation

General Office and Works, Kokomo, Ind.

"Haynes Stellite" is a registered trade-mark of Union Carbide and Carbon Carporation.



"Who murdered this job—man, machine or material?"
Put a Wood and Spencer tap on the case, he's the "private eye" of the production line. Your problem will be solved in no time. Keep out of trouble, stay tap happy. Use the right tap at the right time.

The Wood & Spencer Company Cleveland 3. Ohio



M & M Giant Keyseaters, built in a wide range of sizes, speedily and accurately cut internal keyways or splines in the bores of pulleys, gears, fly wheels or any other machine part. Special fixtures and cutters are available for unusual shaped keyways and taper work. Send us your problems today.

MITTS & MERRILL

64 Holden Street . SAGINAW, MICHIGAN









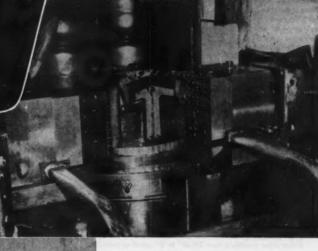
7412 S. Loomis Blvd., Chicago 36, Illinois

In tooling, too ...

Verson

Engineering

Pays
Big Dividends



Close-up of the indexing and piercing die before inserting the tub.

The tub at completion of the six stroke cycle that punches the 1035 holes.

Verson engineers will be pleased to discuss with you tooling related to presses and press brakes; just send an outline of your requirements. Also available is the Verson Die Manual which gives full details on Verson dies for press brakes. If you do not already have a copy of this helpful manual, write for a copy. There's no obligation.

THIS Verson indexing and piercing die punches 1035 holes from the inside out in Maytag washer tubs... in 6 consecutive automatic press strokes it performs operations that formerly required 4 horning presses.

Originators and Pioneers of Allsteel Stamping Press Construction

VERSON ALLSTEEL PRESS COMPANY

9309 South Kenwood Avenue, Chicago 19, Illinois

So. Lamar at Ledbetter Dr., Dallas 15, Texas

A VERSON PRESS FOR EVERY JOB FROM 60 TONS UP

MECHANICAL AND HYDRAULIC PRESSES AND PRESS BRAKES . TRANSMAT PRESSES . TOOLING DIE CUSHIONS . COMPRESSION AND TRANSFER MOLDING PRESSES

Simple Operation!

HARTEX

PLAIN GRINDING MACHINE

Fully automatic, the Hartex RHP Grinding Machine is designed for maximum output with accuracy and speed. It grinds material by the longitudinal process and the plunge cut method with wheels up to 6" face. Hydraulic wheel truing device is template controlled.

PROMPT DELIVERY



PARTIAL SPECIFICATIONS	No. 620	No. 1020
Maximum length ground		40"
	61/2"	61/2"
Grinding wheel diameter	16"	16"
Maximum table swivel	9.	8.
		22-500
Motor, maximum	131/2 HP	131/2 HP

The maximum repid return motion is infinitely adjustable from 0" to 21/2" by .0001".

Other sizes available from 25/64" to 3" grinding capacity.

Write today for full details and specifications!





The new JOHNSON ROTARY WORK ALIGNER is a valuable time and money saver in all work requiring rotation and alignment of stock. Speeds production in repair, welding, manufacturing and assembling departments by eliminating slow expensive set-ups on many miscellaneous jobs.

Proves alignment or run-out accurately on circular work from O D surfaces, without need of centers.

A precision built tool of the finest materials and workmanship. Portable. Easy and simple to operate. Rugged construction to withstand long hard use. Available in four models and sizes. Write today for descriptions and prices to JOHNSON ROTARY WORK ALIGNER.

JOHNSON MACHINE WORKS

617 MENOMONIE STREET EAU CLAIRE, WISCONSIN



BUILD YOUR OWN SPECIAL MACHINES

For any rotary tool operation, build your own special production machines with Millholland Automatic Units. Built in a wide range of sizes, from 34 to 10 H.P., they give high flexibility and maximum cutting efficiency at low cost. Rugged spindle and bearing design prevents "whipping" and tool breakage under heavy loads. Write for complete engineering data, including electrical and air diagrams, gear ratios and 1/4-scale dimension drawings.

DELIVERY - 8 to 12 WEEKS

W. K. MILLHOLLAND MACHINERY CO., INC.

6402 Westfield Boulevard Indianapolis 20, Indiana

At right: Vee Belt Drive At top: Geared Drive







Cheads Cheads

Advt or page 381

THE EASTERN MACHINE SCREW CORP., 23-45 Seriay St., New Haven. Conn. Peofic Goat Representative: A. C. Behringer, 334 N. San Pedro St. Los Angeles, Calif. CANADA: P. Barber Machinery Company, Toronto

COMMERCIAL TOOL HARDENING AND HEAT TREATING

Strictly Modern Equipment, Backed by the Skill and Judgment of 40 Years' Experience. Also, We Sell "Heat-Easy" Compound for Pack Hardening High Speed and High Carbon—High Chrome Steels.

THE BENNETT METAL TREATING COMPANY, Elmwood, Conn.

HANCHETT METAL SAW SHARPENERS

Made in three sizes. Here is an accurate, long-lived machine designed for automatic grinding of cold metal cutting saws. Rigid, solid construction with ball-bearing mounted head slides and controlled cam action.



Two Views of High and Low **Toothed Metal** Cutting Saws.

FOR INSERTED TOOTH, SEGMENTAL TYPE, SOLID TOOTH CIRCULAR SAWS SAW CAPACITIES-8 IN. TO 72 IN. AND LARGER

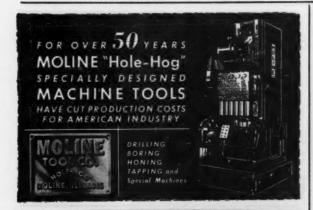


HANCHETT MANUFACTURING CO.

MAIN OFFICE-Big Rapids, Mich.

WEST COAST-Portland 4, Ore.

World's Largest Manufacturers of Shear Blade, Knife and Saw Grinding Machinery



KAUFMAN TAPPING MACHINES BUILT FOR SPECIFIC PRODUCTION

Every machine precision-built to meet the requirements of individ-ual production jobs. Designed with fully automatic cycle, single or multiple spindle heads, and other most advanced features.

Write for complete information

KAUFMAN MFG. CO.

Manitowac

13

.

.

Wisconsin





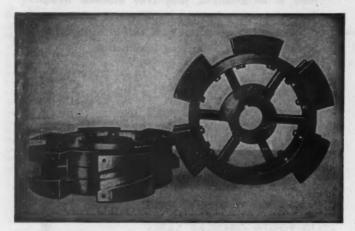
Rigidly built and carefully constructed for top performance and production economy, these radial drilling machines feature hardened and ground gears of high tensile alloy steel, accurately balanced and precision cut.

PARTIAL SPECIFICATIONS	TR-1H	TR-2N
Drilling cap. in cast iron	256"	256"
Drilling cap. in steel	2"	2"
Max. drilling radius	45%"	6536"
Vert. travel of spindle	1334"	1394"
Spindle speeds (16)	40-1500 rpm	40-1500 rpm

e Write us for complete information!

KELVIN SYSTEMS CORPORATION

Rowbottom/s-Cams



 The cam illustrated - made of interchangeable steel segments - is an example of Rowbottom service in designing and manufacturing cams for unusual applications. For every cam, whatever the material, size, type, or function, get Rowbottom estimates first!

of Every Type and Size

Cams - and cams only! That is why it pays to let Rowbottom handle your problems of cam design and production. Our entire facilities are devoted to cam manufacture only and our experience in this particular field makes Rowbottom the logical choice whenever you need cams.

THE ROWBOTTOM MACHINE CO., Waterbury, Conn., U. S. A.



ENGINEERED FOR PRODUCTION

Diefendorf makes gears to meet the exacting standard of the engineer who designs for production-quality in material and workmanship. All materials. All

DIEFENDORF GEAR CORPORATION

Syracuse 1, New York

DIEFEND



2829 13th AVE. S., MINNEAPOLIS 7, MINN.

2606 MARTHA ST., PHILADELPHIA 25, PA.

ISLER JIG BORING . CAMS A SPECIALIZED CAM
MILLING SERVICE . . JIG BORING
SPOT WELDING . CONTRACT
PRODUCTION . EXPERIMENTAL



SMALL GEAR AND PINION PRODUCTION THAT'S

Automatic!

Autometic loading and unloading feature eliminates lost motion in producing accurate small diameter, fine pitch gears and pinions on the Waltham. Individual motor drive through step cone pulleys gives a wide range of feeds and speeds. Compact design takes up less than 4 sq. ft. on the bench. If you want accurate . . . fast . . . economical small gear production get full information.





OTHER STYLES AND SIZES IN NEW MANUAL ON FINISHING

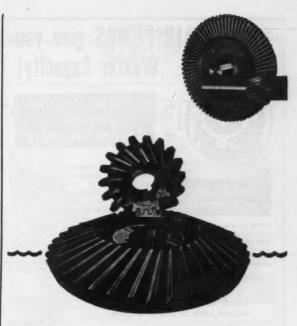
.

WALLS SALES CORP.

Motor and automatic band tension control. Nothing like it for finishing metals, plastics, wood, fibre, etc.

333 Nassau Avenue, Brooklyn 22, N.Y.



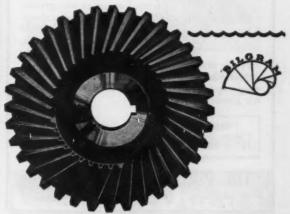


GEAR REQUIREMENTS?

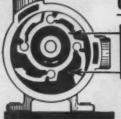
Whatever your needs may be in the line of gears—
if you want quality gears economically produced,
BILGRAM IS THE ANSWER! Any material, any
quantity, any type—Bevel Gears with straight or
spiral cut teeth — Ellipticals — Herringbones —
Helicals—Racks—Spurs—Hypoids—Worms. Over
60 years' experience, specially designed equipment
and fully modern plant assure satisfaction.
Estimates gladly furnished.

BILGRAM GEAR & MACHINE WORKS

Manufacturers of Bevel Gear Generators and Chamfering Machines 1217-35 Spring Garden St., Philadelphia 23, Pa.



LEIMAN AIR PUMPS give you **Greater Capacity!**



SMALLER PISTONS provide LARGER AIR SPACE

HINGED WINGS take up their own wear . Compare this cross-section of a Leiman Air Pump with any other rotary air pump. It is working air space that counts—and Leiman provides 2 to 3 times more area, per size and weight of pump.

What is your air application? Send us details. Leiman engi-neers affer over 60 years' ex-perience with thousands of air applications. Cetaleg and As-plication Date sent on request.

Handle your pressure, vacuum or suction Jobs with much smaller Leiman Air Pumps. Save weight and space—have fewer moving parts no springs, gaskets or packing-no trouble.

For Pumps-write DEPT. A

Metal Cleaning and Finishing without acids or scratch brushes

LEIMAN SANDBLASTS

Fast, low-cost, safe, uniform way to clean scaly, rusty, rough surfaces-prepare for plating and finishing — stencil letters and designs — more rapid matte or satin finishes. Use unskilled help. For Sandblasts-write DEPT, B

LEIMAN BROS., INC. 197 Christie St., N. J.





" PULL-GEAR " SPEED-REDUCING PULLEY Increases Drill Press Capacity





Amazing new internally geared speed reducer doubles drill press capacity. Greater power, greater efficiency, greater productivity.

Provides the correct speed and power for larger drilling,

reaming, tapping and boring on light presses. Easily installed in five minutes. Adaptable to all type machines. Spindle speed range approximately 45 to 2000 RPM. Write for literature.

Made in 3 Motor Shaft Sizes
1/2" • 5/8" • 3/4"

Some Territories Open to Jobbers

THE PULL-GEAR CO.





Stahl precision is embodied in these racks, which are made in all shapes and up to 20 feet long, 3 DP. Flawless in operation, they are fabricated to your exact specifications and at prices that will please you. Stahl's skill and experience, with facilities that insure quick delivery, are at your disposal. For the finest in racks or gears it will pay you to get Stahl's estimate first.

SPURS TO 72" PD, 1 DP BEVELS TO 54" PD, 1 DP SPIRAL, HELICAL and WORM GEARS TO 48" PD, 2 DP CONTINUOUS-TOOTH HERR TO 60" PD, 2 DP SPROCKETS TO 72" PD, 21/2" CP RACKS TO 20 FT. LONG, 3 DP

SILENT GEARS; RAWHIDE, BAKELITE, FABROIL HEAT-TREATED, CASE OR FLAME NARDENED GEARS -OF CARBON OR ALLOY STEEL

GEAR & MACHINE COMPANY 3901 Hamilton Ave. Cleveland 14, Ohio

MACHINERY'S MATHEMATICAL TABLES

A special book containing 126 pages of the mathematical tables used daily in drafting-rooms and in many shops, including powers and roots of numbers, circumferences and areas of circles, functions of angles, and logarithms. The tables of squares, cubes, square roots, cube roots and reciprocals cover numbers from 1 to 2000. The tables of circumferences and from 1 to 2000. The tables of circumferences and areas are for diameters ranging from 1/64 to 100. The trigonometric functions advance by minutes and degrees and are given to five decimal places. The logarithm tables are also to five decimal places. All of these tables are the same as the ones in MACHINERY'S HANDBOOK, but this small book is especially adapted to continual usage and quick reference. Send your order and \$1.50 to

THE INDUSTRIAL PRESS, 148 Lafayette St., N. Y. 13

ALL MAKES . . . Special and Standard

PRECISION GEARS UP TO 200 DIAMETRAL PITCH

All Gears certified for Accuracy Quality and Fine Workmanship

NEW JERSEY GEAR & MFG. CO. Hillside, N. J. 1470 Chestnut Ave.



INSPECTION

GEORGE SCHERR CO., Inc. • 202 LAFAYETTE ST. • N. Y. 12. N.





IMPROVE FACING OPERATIONS

MUMMERT-DIXON COMPANY, HANDVER, PA

On Baring

M-D Facing Head feeds automatically. Lathe tool bit travels radially, from center outward or reverse. 10 sizes 6" to 46" dia. Write for Bul-

11

8

7

AMES PRECISION MACHINE WORKS



CENTER DRILLS

KEYSEAT CUTTERS

plote set—41 sixes— ne and money, bec

CENTER REAMERS



WE MAKE THE STEEL-

All of our steel is made in our Heroult
Basic Electric Steel Furnaces. We use only electric steel because it is cleaner and subject to closer control. This means your forgings are of the best quality obtainable.

NATIONAL FORGE & ORDNANCE COMPANY
IRVINE, WARREN COUNTY, PENNA.





HARDNESS TESTING

Brinell-Shore-Scale

Included in our improved Portable
Scieroscope Model D-1. This efficient
single scale tester registers BrinellShore values without damage to the
work. The old standby for forty-three
years.

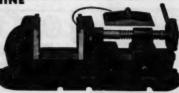
WRITE FOR CIRCULAR

THE SHORE INSTRUMENT & MANUFACTURING CO., INC. 99-35 Van Wyok Expressway, Jamaica, 35, N.Y.

GEM MACHINE

Complete range of Sizes and Types Send for Catalog

J. E. MARTIN MACHINE WORKS SPRINGFIELD, OHIO



















Rigidly built machine with heavy construction throughout.

Tapered roller bearings and anti-friction spindle guarantee smooth operation.

Write for Catalog!

SPECIFICATIONS

able surface . . . 52" x 12" ong. table traverse . . . 28" ross traverse . . . 10" ertical traverse . . . 18" sed range . . . 18 peed range . . . 1600-31.5 RPM

SALES TERRITORIES OPEN



Classified and Re-Sale Section

WORLD'S LARGEST STOCK STAMPING PRESSES

BLISS . CLEARING . CLEVELAND FERRACUTE . HAMILTON . L & J NIAGARA . TOLEDO . V & O



SOUARING SHEARS . PRESS BRAKES REBUILT and GUARANTEED

JOSEPH HYMAN & SONS

TIOGA. LIVINGSTON & ALMOND STS. PHILADILPHIA 14 PA PERIN REGENT 9-7727

- FOR SALE

 (4) Four Spindle National Aeme Automatics,
 %" collet cap.
 (1) Four Spindle National Aeme Automatic,
 1" collet cap.
 May be seen in operating condition. Best
 offer accepted.

GEAR GRINDING MACHINES
EXTERNAL SPLINE AND GEAR GRINDER,
Detroit, Model SG-33, 48" between centers,
12" Diameter Maximum Capacity.
Will sell best offer or trade for No. 3 or
No. 4 Miller capable of horizontal and vertical milling.

tical milling.

INTERNAL SPLINE AND GEAR GRINDER,
Detroit, Model GG-30F. Both Machines in
axcellent condition and can be seen operating. Best offer accepted.

LEONARD BRODY INDUSTRIES

365 Henry Street Fairview, New Jersey

AUTOMATICS FOR SALE

CONOMATIC, 8 spindle 156" capacity, serial No. 4455-VB.

CONOMATIC, 4 spindle 21/4" capacity, serial No. 1285-Y

seriol No. 1203-T
Both machines complete with tooling and reconditioned, excellent buys. Also:
Lees-Bradner Thread Miller, No. 40-A-263, automatic chucking type.
Canedy-Otto 6-spindle Gang Drillpress with No. 2 Morse toper spindles.

BARRETT MACHINE WORKS

1119 Hub Street Houston, Texas Tel.: Wayside 2335.

MACHINE TOOLS

H

No. 4 Cincinnuti Vertical High Power Milling Machine Timken Bearing, with 20" Power Retary Table MACHINE TOOLS "IN STOCK" FALK MACHINERY CO.

18 Ward Street-BA 5887-Rochester, N. Y.

Eastern Rebuilt Machine Tools

THE SIGN OF QUALITY . THE MARK OF DEPENDABILITY

SLOTTERS

- 10" Newton, m.d.
 10" Newton, cone
 12" Bement-Miles, m.d.
 15" Canada, m.d.
 18" Dill, m.d.
 18" Miles-Bement, s.p.d.
 18" Betts Crank Slotter, m.d.
 20-34" Dill, m.d.
 42" Betts, m.d.
 48" Niles, m.d.

SHEET METAL MACHINERY

Gray Turret Head Metal Cutter, cap. 34", 86" threat
No. 2 Libert Nibiler, 36" threat
130" No. 100 Ningara Heavy Production Folder, 16 ga., md.
No. 3-54" cap. Gray Sheet Metal Cutter, m.d.
8' x 34" cap. No. 188 Dreis & Krump Leaf
Brake, m.d.
No. 336—32, 34" W. J. Savage Co., Nibbler
6' x 14 gauge Bertsch Shear, s.p.d.

TURRET LATHES AND SCREW MACHINES

TURRET LATHES AND SCREW MACHINES

We. 601 Oster Geared Head Rapidaction, m.d.
in leg, chucking

No. 1 Cincinnati-Acme Semi-Universal, m.d.
No. 1 Warner & Swasey, bar, m.d.
No. 1A Warner & Swasey, bar, m.d.
No. 1A Gishelt, m.d., Timken
No. 2 Cincinnati-Acme Full-Universal, m.d.
No. 2A Warner & Swasey, m.d., bar
No. 2B Warner & Swasey, m.d., bar
No. 3F Foster Fastermatic, m.d., Timken
No. 3 Cincinnati-Acme Full-Universal, m.d.,
chucking
No. 3 Foster Geared Head, m.d., bar
No. 3F Foster Fastermatic, m.d., Timken
No. 4 Warner & Swasey Flain, cone, bar and
chucking types
No. 4E Warner & Swasey Universal, m.d.,
chucking
No. 4E Victor Fastermatic, m.d., latest

chucking
Me. 4FU Foster Fastermatie, m.d., latest
No. 5 Foster Universal, m.d., bar, late type
Me. 7 Bardons & Oliver, cone
%" Pratt & Whitney Hand Screw Machine,

21/x24", 3x36", 31/x32", 4x34" Jenes & Lam-son Geared Head, m.d., bar and chucking

son Geard types 18" Libby, Type A, m.d., chucking 20" Acmo, s.p.d., bar 20" Acme, s.p.d., par 30" Dreses 26" Libby Type C, m.d., chucking

BROACHING MACHINES

75 H.P. Lapointe Hydraulic Breach, m.d. Cincinnati Mill Breach, m.d., 19" spindles, new

RADIAL DRILLS

3½' Fosdick, gear ber on base 4'—11" cel. Cincinnati-Bickford, m.d., late 4'—13" cel. Cincinnati-Bickford, Super-Service, m.d., late 5'—17" cel. Dreses, gear ber, m.d. Zowo Precision Universal Bench Type Radials, m.d., new

ARROR PRESSES

No. 37E Wilson Hydraulic, hand operated, 80 tons, new Mrbor Press, floor type, hand operated. No. 5 Greenerd Arbor Press, floor model, m.d.

AUTOMATICS

4 spindle 114" Conomatic, m.d., bar, 1942 machine
He. 5D Potter & Johnston, m.d.
He. 6A Petter & Johnston, m.d.
He. 6C Fetter & Johnston, m.d.
He. 6C Finders Type, m.d.
4 spindle 314" Cleveland Medel "K", m.d.
4" "Guveland Medel A, m.d.
6" Cleveland Medel A, m.d.
74" "Gloveland Medel A, m.d.
He. 8A Cleveland, m.d., 8" cap., latest

BOLT THREADERS

Victor Nut Facing Machine, m.d., cap. %" te 2" nuts
2" nuts
1" Landis Double Spindle, m.d. thru gear box
1\" Landis 2 spindle, late
1\'_2" Landis 2 spindle, elder type

HORIZONTAL BORING MILLS

Mill, S' long x 10% wine x 33" anga, S' x alots
Floor Plate conxisting of box type Planer Table,
31' long x 48" wide, 18" thick
4"x11' Rectangular Table, 48" high

VERTICAL BORING MILLS

24" Bullard New Era, m.d. 26" Bullard New Era, m.d. 42" Bullard Spiral Drive, m.d. 42" Kag, m.d. 48" Colburn. m.d., 2 swivel heads 100" Miles Heavy, m.d., p.r.t.

We carry an average stock of 2,000 machines. Let us quote on your requirements.

EASTERN MACHINERY COMPANY

WANTED - USED OVERHEAD BRIDGE CRANE

with structures approximately 110 feet wide by 400 feet long. Submit full details. SOUTHERN TIN COMPRESS CORP., 1270 North Seventh Street, Memphis, Tenn

SWEDISH FACTORY

for production of electric water-heaters, etc. Seeks for expansion of its production scheme, license manufacture for Sweden of new articles in the plate press line. Reply with necessary information to "License" Gumaelius Advertising, Malmo, Sweden.

REPRESENTATIVES WANTED

Have openings for capable representatives in metropoliton New York, north and south New York, eastern Penna., Delaware and Maryland.

Applicants must have good following in die and mold field, and be able to demonstrate our Di-Profiler in the shops. Men with 2 or 3 other items can increase their income considerably.

Please address your reply to Nord International Corp., P. O. Box 44, Danville, N. J., or phone Reckawey (N. J.) 9-3199.

Classified and Re-Sale Section





... for more value!

Broome and Lafayette Sts., New York 13

MANUFACTURING OPPORTUNITY

The exclusive manufacturer of a line of high class, nationally advertised Machine Tools carrying the highest priority and badly needed for National Defense Program, is offered to a well-equipped manufacturing plant, Midwest location preferred, having approximately 6000 sq. ft. of space and about 5000 or more man hours available monthly. Weights of Machines range from 5000 lbs. to 8500 lbs. each. Complete drawings, patterns, jigs, fixtures, operating data, bills of materials, etc., are available. The manufacturing of these well-known Machine Tools is being offered on a long-term basis, by the owners of the business. Those truly interested are invited to send their responses with particulars to

> Box No. 632, MACHINERY 148 Lafayette Street, New York 13, N. Y.

• Are there any machines or equipment you need, or would like to sell? Advertisements in MACHINERY'S Classified and Re-Sale Section bring results! Rates are \$10.00 per single-column inch. Send payment with your order.

Classified Advertising Department

MACHINERY, 148 Lafayette St., New York 13, N. Y.

MILES' QUALITY

BROAGH. 18 ton 42" streke V48 American
vert.
COMPRESSOR. 194 Ou. Ft. Ing. Rand 40 T.
DRILL. 35" American sson. radial
DRILL. 4s pindle No. 4½ Footo-Burt rail
DRILL. 4s pindle No. 4½ Footo-Burt rail
DRILL. 4s Political
DRILL. 4s pindle No. 4½ Footo-Burt rail
DRILL. 34 spdl. No. A18 Natoe mult.
GEAR HOBEER. No. 12M Gould & Eberhardt
GEAR HOBEER. No. 12M Gould & Eberhardt
GEAR HOBEER. 76" Westinghouse
GEAR GERERATOR. 4" Glisson spiral
GEAR GERERATOR. 4" Glisson spiral
GEREDER. 5"30" Clientmal ER
GRINDER. 8"30" Clientmal ER
GRINDER. 53" No. 24 Gardes reptz. dise
GRINDER. 53", No. 84A Gardesr opposed
disc

SEND FOR COMPLETE LIST

MILES MACHINERY COMPANY

Box 770

SAGINAW, MICHIGAN

SALES MANAGER

with knowledge and trade following in Swiss Type Automatics offered New York area. Apply with full information. Replies held confidentially. Box No. 636, MACHINERY, 148 Lafayette Street, New York 13, N. Y.

FOR SALE

1 Tishken Cold Roll Forming Machine 14ML, 1½" spindle, 5 HP variable speed motor, 220 AC. Complete with Tishken CO-2-H cutoff 1800 RPM motor, stop and starting controls, pumps and stand. Used little. Box No. 684, MACHINERY, 148 Lafayette Street, New York 13, N. Y.

FOR SALE

7 Hammond buffing lathes, 10 HP, 2400 RPM, Model 10-ROH, 220 V, 3 phase, 60 cycle, push button control, belt driven; 2-3 years old, excellent condition. Box No. 633, MACHINERY, 148 Lafayette St., New York 13, N. Y.

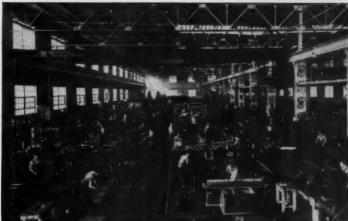
EXCLUSIVE REPRESENTATIVES

Wanted for Selling Small Diamond Carbide Tungsten Metal Bonded Tools (From .030 Up). Used in Any Internal Grinder or Jig-Grinder at High or Low Speed for Carbide Tungsten, Hord Steel (From 60 Up). Only Firms Representing Similar Lines Please Apply to Bex No. 633, MACHINERY, 148 Lefsyette Street, New York 13, N. Y.

BALL BEARINGS . ROLLER BEARINGS ALL SIZES - ALL TYPES WRITE OR WIRE YOUR NEED!

NEERUP INDUSTRIAL EQUIPMENT

TRUE · Your Worn Machines can be New again



WHAT WE MEAN BY RE-MANUFACTURING: To bring a machine back to its original state of usefulness every machine is: 1 Completely disassembled, thoroughly cleaned, flat surfaces tested out with straightedges or surface plates. 2 Flat Surfaces Ground or Planed, and then hand scraped to precision surface plates. 3 Bearings, Bushings, Gears and other component parts replaced when necessary. 4 Exterior Reflished so that machine looks new. 5 Adjustments Made carefully under competent supervision. 6 Tested Under Power for both operation and accuracy before it leaves our plant so that you can be confident that it is ready to go to work when you get it. 7 Year Inspection is invited at any time.

MANUFACTURED. And, the vast facilities and high standards of Hill-Clarke give you the finest re-building obtainable. That is why we welcome your inspection and inquiries.

You Benefit by using a concern of engineering experts and long experience. Good re-building is not learned overnight.

ALL you need is to have them RE-

You Benefit by using a concern that is tried and tested. Hill-Clarke is the oldest Re-builder in the nation.

We Can Handle any machine tool that can be loaded onto a freight car.

HILL-CLARKE MACHINERY COMPANY

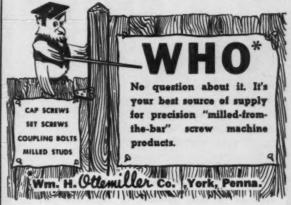
H. W. MONS, President W. L DITFURTH, Vice-Pres. T. H. PRICE, Secretary

HILL-CLARKE MACHINERY COMPANY

CHICAGO 6 CEntral 6-0500







THE LANGUAGE MECHANICAL INDUSTRIES

Drawing is the universal language of engineering practice, and a knowledge of this useful "language" is indispensable to any man who means to get on in the mechanical field.

"Mechanical Drawing," a 342-page book with 179 illustrations, gives you the whole subject simply, clearly, dependably.

This book deals with the drawing of mechanisms and machine details, and covers comprehensively the making of different classes of drawings; their dimensioning, reading, and checking; numbering and filing systems; and general drafting-room practice. The relation between drawing and designing is also explained. Price, \$3.00.

THE INDUSTRIAL PRESS • 148 Lafayette Street • New York 13, N.Y.





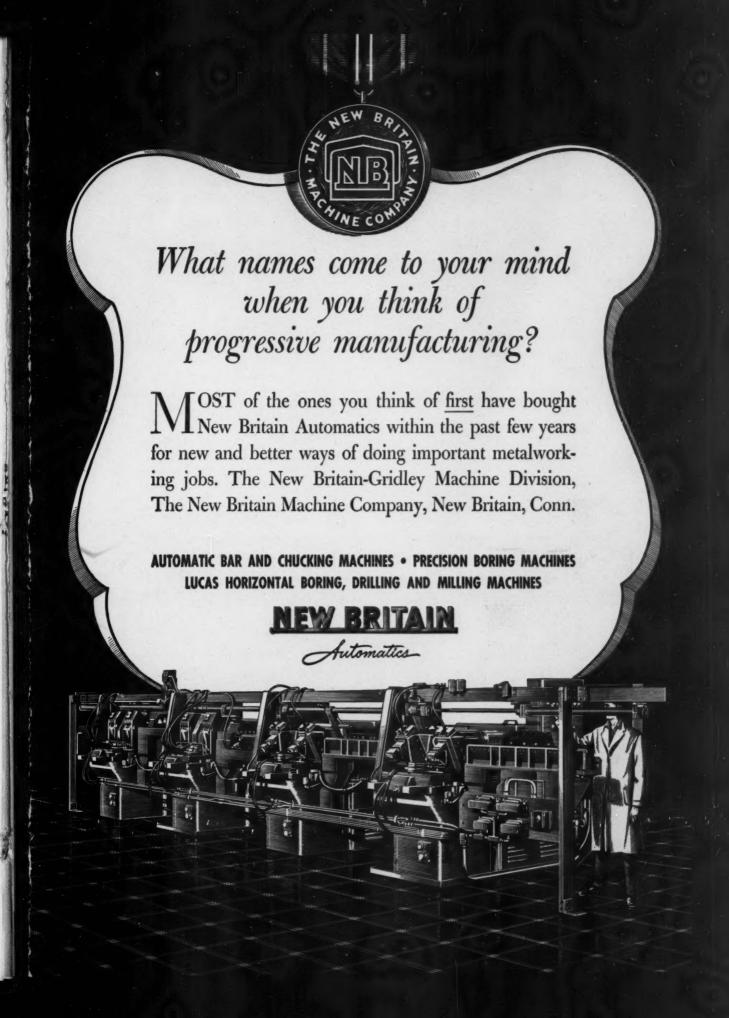
ALPHABETICAL INDEX OF ADVERTISERS

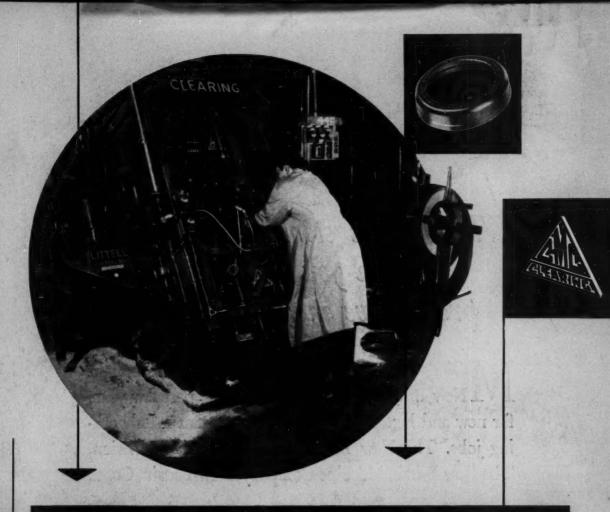
A	Cincinnati Milling Machine	G	Lapointe Machine Tool Co.,
Abrasius Mashins Test Co. 42	Co Insert 34-35	0.11	386-387
Abrasive Machine Tool Co 62	Cincinnati Milling Machine Co.,	Gallmeyer & Livingston Co 32	La Salle Steel Co 311
Adamas Carbide Corp 388	Grinding Wheels Div110-111	Gardner Machine Co 27	LeBlond, R. K., Machine Tool
Air Reduction Sales Co 143	Cincinnati Milling Products	Garlock Packing Co 369	Co 58-59
Allegheny-Ludium Steel Corp 268	Div., Cincinnati Milling	General Electric Co304-305	Lehmann Machine Co 72
Allen Bradley Co., Insert bet. 44-47	Machine Co 29	Giddings & Lewis Machine	Leiman Bros., Inc 426
Aluminum Co. of America105-108	Cincinnati Shaper Co 235	Tool Co14-15	Leland-Gifford Co 24
Ampco Twist Drill Div.,	Cities Service Oil Co 275	Gisholt Machine Co36-54	Lincoln Electric Co 407
Greenfield Tap & Die Corp.	Classified Advertisements431-432	Gleason Works 365	Lipe-Rollway Corp 296
Inside Front Cover	Clearing Machine Corp., Back Cover	Gorham Tool Co 356	Lodge & Shipley Co 409
American Broach & Mch. Co.,	Cleveland Crane & Engrg. Co. 401	Gorton, George, Machine Co 272	Logan Engineering Co 385
Insert bet, 74-89	Cleveland Punch & Shear Works	Goss & DeLeeuw Machine Co. 280	Logansport Machine Co., Inc 303
American Chain & Cable321-429		Grant Mig. & Machine Co 420	
American Felt Co 52	Co	Gray, G. A., Co 71	Lowe Brothers Co
American Optical Co 128	Cleveland Twist Drill Co.,	Greenfield Tap & Die Corp.,	Lubriplate Div., Fiske Bros.
American Steel Foundries 289	Insert 129	Ampco Twist Drill Div.	Refining Co 291
American Tool Works Co 67	Climax Molybdenum Co 380	Inside Front Cover	Lucas Machine Div., The New
Ames, B. C., Co 302	Columbus Die-Tool & Mch. Co 418	Greenlee Bros. & Co.,	Britain Machine Co 434
Ames Precision Machine Works 427	Cone Automatic Machine Co.,	Insert bet. 74-89	Luers, J. Milton 433
	Inc 113		
Anderson Bros. Mfg. Co.,	Consolidated Machine Tool	Grob Brothers 422	
Insert bet. 74-89	Corp135-301		M
Armstrong-Blum Mfg. Co 38	Crane Packing Co 408	H	
Armstrong Bros. Tool Co 48	Cross Company 244		Madison-Kipp Corp 411
Arter Grinding Machine Co 390	Crucible Steel Co. of America 93	H. E. B. Machine Tools, Inc 389	Madison Manufacturing Co 334
Atkins Saw Div., Borg-Warner	Cumberland Steel Co 104	Hamilton Tool Co 312	Marac Machinery Corp 359
Cerp 355	104	Hammond Machinery Builders,	Marlin-Rockwell Corp 35
Atlantic Gear Works, Inc 427		Inc 328	Martin, J. E., Machine Works 421
Axelson Manufacturing Co 273	D	Hanchett Mfg. Co 423	Master Manufacturing Co 410
	HEART TO THE REAL PROPERTY.	Hannifin Corporation115-323	
В	Danly Machine Specialties,	Hapman Conveyors, Inc 391	Materials Section93-101
		Hardinge Brothers, Inc 146	Mattison Machine Works,
Ball & Roller Bearing Co 427	Inc. 285	Hartford Special Machinery Co. 310	Insert bet, 74-89
Barber-Colman Co.,	Davis Boring Tool Div., Gid-		McCroaky Tool Corp 131
Insert bet, 74-89	dings & Lewis Machine Tool	Haynes Stellite Co., Div.Union	Metal Carbides Corp 430
Bardons & Oliver, Inc 126	Co 259	Carbide & Carbon Corp 419	Michigan Tool Company 239
Barnes Drill Co Insert bet. 74-89	Davis Keyseater Co 420	Heald Machine Co	Micro Div. of Minneapolis-
Barnes, W. F. & John, Co.,	Dayton Rogers Manufacturing	Heller Brothers Co 281	Honeywell Regulator Co 416
	Co 424	Hendey Machine Co 339	Micromatic Hone Corp 136
Bath, Cyril, Company 372	De Laval Separator Co 363	Hill Acme Co 335	Miles Machinery Co 432
	Delta Power Tool Div., Rock-	Hill-Clarke Machinery Co 433	Millers Falls Company 368
Baush Machine Tool Co 325	well Manufacturing Co 341	Hirschmann, Carl, Co 287	Millholland, W. K., Machinery
Bay State Abrasive Products	Denison Engineering Co 417	Hoglund Engineering & Manu-	Co., Inc 422
Со 295	Detroit Broach Co 240	facturing Co., Inc 340	Mitts & Merrill 420
Bennett Metal Treating Co422	Diefendorf Gear Corp 424	Homestrand, Inc 392	Modern Machine Tool Co 338
Besley-Welles Corp 109	Diversified Metal Products Co. 396	Horton, E., & Son, Co 346	Moline Tool Co 423
Bethlehem Steel Co95-102	DoAll Company382-383	Hufford Machine Works, Inc 261	Monarch Machine Tool Co 53
Bilgram Gear & Machine Works 425	Dow Chemical Co 98	Hunt, C. B., & Son, Inc 357	Morey Machinery Co., Inc.,
Black & Decker Manufacturing	Dreis & Krump Mig. Co 420	Hydraulic Press Mfg. Co 123	419-422-430-432
Co	Dumore Co		
Blake, Edward, Co 322	Damote Co. mananana 204		Morgan Engineering Co 425
Blanchard Machine Co 138		1	Morse Twist Drill & Machine
Bowser, Inc 352	P	Illinois Coor & Marking Co. 201	Co20-21
Bristol Company 360	E	Illinois Gear & Machine Co 293	Motch & Merryweather Mchry.
British Industries Corp 395		Industrial Press342-343-381	Co 313
Brown & Sharpe Mfg. Co	Eastern Machine Screw Corp 422	Ingersoll Milling Machine Co.,	Mummert-Dixon Co 427
Insert 229-232	Eastern Machinery Co 431	Insert bet, 74-89	Murad Developments, Ltd 398
Bryant Chucking Grinder Co.,	Eastman Kodak Co 397	Ingersoll-Rand Co 404	
Insert bet, 54-57	Eaton Manufacturing Co., Re-		
Bryant Machinery & Engineer	liance Div 349	1	N
Bryant Machinery & Engineer-	liance Div	J	N
ing Co 307	liance Div	J Jahn, B., Míg. Co 298	National Acme Co69-92
ing Co	liance Div	J Jahn, B., Míg. Co	
ing Co	liance Div	Jarvis, Charles L., Co370-371	National Acme Co
ing Co	liance Div. 349 Eisler Engineering Co., Inc. 424 Electro-Snap Switch & Mfg. Co. 418 Engis Equipment Co. 348 Espen-Lucas Machine Works. 141	Jarvis, Charles L., Co370-371 Johnson Bronze Co	National Acme Co
ing Co. 307 Buffalo Forge Co. 300 Bullard Company Insert bet. 64-67 Bunell Machine & Tool Co. 331 Bunting Brass & Bronze Co. 94	liance Div. 349 Eisler Engineering Co., Inc. 424 Electro-Snap Switch & Mfg. Co. 418 Engis Equipment Co. 348 Espen-Lucas Machine Works. 141 Ettco Tool Co., Inc. 376	Jarvis, Charles L., Co370-371 Johnson Bronze Co	National Acme Co
ing Co	liance Div. 349 Eisler Engineering Co., Inc. 424 Electro-Snap Switch & Mfg. Co. 418 Engis Equipment Co. 348 Espen-Lucas Machine Works. 141	Jarvis, Charles L., Co. 370-371 Johnson Bronze Co. 366 Johnson Machine & Press Corp. 277 Johnson Machine Works 422	National Acme Co
ing Co. 307 Buffalo Forge Co. 300 Bullard Company Insert bet. 64-67 Bunell Machine & Tool Co. 331 Bunting Brass & Bronze Co. 94	liance Div. 349 Eisler Engineering Co., Inc. 424 Electro-Snap Switch & Mfg. Co. 418 Engis Equipment Co. 348 Espen-Lucas Machine Works. 141 Ettco Tool Co., Inc. 376	Jarvis, Charles L., Co370-371 Johnson Bronze Co366 Johnson Machine & Press Corp. 277 Johnson Machine Works422 Jones & Lamson Machine	National Acme Co
ing Co. 307 Buffalo Forge Co. 300 Bullard Company Insert bet. 64-67 Bunell Machine & Tool Co. 331 Bunting Brass & Bronze Co. 94 Butterfield Div., Union Twist 96 Drill Co. 89	liance Div. 349 Eisler Engineering Co., Inc. 424 Electro-Snap Switch & Mfg. Co. 418 Engis Equipment Co. 348 Espen-Lucas Machine Works. 141 Ettco Tool Co., Inc. 376 Ex-Cell-O Corporation 252	Jarvis, Charles L., Co. 370-371 Johnson Bronze Co. 366 Johnson Machine & Press Corp. 277 Johnson Machine Works 422	National Acme Co
ing Co	liance Div. 349 Eisler Engineering Co., Inc. 424 Electro-Snap Switch & Mfg. Co. 418 Engis Equipment Co. 348 Espen-Lucas Machine Works. 141 Ettco Tool Co., Inc. 376	Jarvis, Charles L., Co370-371 Johnson Bronze Co366 Johnson Machine & Press Corp. 277 Johnson Machine Works422 Jones & Lamson Machine Co122-269	National Acme Co
ing Co. 307 Buffalo Forge Co. 300 Buffalo Forge Co. 300 Bullard Company Insert bet. 64-67 Bunell Machine & Tool Co. 331 Bunting Brass & Bronze Co. 94 Butterfield Div., Union Twist Drill Co. 89 C	liance Div. 349 Eisler Engineering Co., Inc. 424 Electro-Sanp Switch & Mfg. Co. 418 Engis Equipment Co. 348 Espen-Lucas Machine Works. 141 Ettco Tool Co., Inc. 376 Ex-Cell-O Corporation 252	Jarvis, Charles L., Co370-371 Johnson Bronze Co366 Johnson Machine & Press Corp. 277 Johnson Machine Works422 Jones & Lamson Machine	National Acme Co
ing Co. 307 Buffalo Forge Co. 300 Buffalo Forge Co. 300 Bullard Company Insert bet. 64-67 Bunell Machine & Tool Co. 331 Bunting Brass & Bronze Co. 94 Butterfield Div., Union Twist Drill Co. 89 C C & C Sales Corp. 270	liance Div.	Jarvis, Charles L., Co370-371 Johnson Bronze Co	National Acme Co
ing Co. 307 Buffalo Forge Co. 300 Bullard Company Insert bet. 64-67 Bunell Machine & Tool Co. 331 Bunting Brass & Bronze Co. 94 Butterfield Div., Union Twist Drill Co. 89 C C & C Sales Corp. 270 Campbell Machine Div., Amer-	liance Div.	Jarvis, Charles L., Co370-371 Johnson Bronze Co366 Johnson Machine & Press Corp. 277 Johnson Machine Works422 Jones & Lamson Machine Co122-269	National Acme Co
ing Co. 307 Buffalo Forge Co. 300 Buffalo Forge Co. 300 Bullard Company. Insert bet. 64-67 Bunell Machine & Tool Co. 331 Bunting Brass & Bronze Co. 94 Butterfield Div., Union Twist Drill Co. 89 C C C & C Sales Corp. 270 Campbell Machine Div., American Chain & Cable. 321	liance Div.	Jarvis, Charles L., Co370-371 Johnson Bronze Co	National Acme Co
ing Co. 307 Buffalo Forge Co. 300 Bullard Company Insert bet. 64-67 Bunell Machine & Tool Co. 331 Bunting Brass & Bronze Co. 94 Butterfield Div., Union Twist Drill Co. 89 C C & C Sales Corp. 270 Campbell Machine Div., Amer-	liance Div.	Jarvis, Charles L., Co	National Acme Co
ing Co. 307 Buffalo Forge Co. 300 Buffalo Forge Co. 300 Bullard Company. Insert bet. 64-67 Bunell Machine & Tool Co. 331 Bunting Brass & Bronze Co. 94 Butterfield Div., Union Twist Drill Co. 89 C C C & C Sales Corp. 270 Campbell Machine Div., American Chain & Cable. 321	liance Div.	Jarvis, Charles L., Co	National Acme Co
ing Co. 307 Buffalo Forge Co. 300 Buffalo Forge Co. 300 Bullard Company Insert bet. 64-67 Bunell Machine & Tool Co. 331 Bunting Brass & Bronze Co. 94 Butterfield Div., Union Twist Drill Co. 89 C C & C Sales Corp. 270 Campbell Machine Div., American Chain & Cable. 321 Carboloy Department of General Electric Co. 266-267	liance Div.	Jarvis, Charles L., Co	National Acme Co
ing Co. 307 Buffalo Forge Co. 300 Buffalo Forge Co. 300 Bullard Company. Insert bet. 64-67 Bunell Machine & Tool Co. 331 Bunting Brass & Bronze Co. 94 Butterfield Div., Union Twist Drill Co. 89 C C C & C Sales Corp. 270 Campbell Machine Div., American Chain & Cable. 321 Carboloy Department of General Electric Co. 266-267 Carborundum Co. 40-41	liance Div.	Jarvis, Charles L., Co	National Acme Co
ing Co. 307 Buffalo Forge Co. 300 Buffalo Forge Co. 300 Bullard Company Insert bet. 64-67 Bunell Machine & Tool Co. 331 Bunting Brass & Bronze Co. 94 Butterfield Div., Union Twist Drill Co. 89 C C C & C Sales Corp. 270 Campbell Machine Div., American Chain & Cable. 321 Carboloy Department of General Electric Co. 266-267 Carborundum Co. 40-41 Card, S. W., Mfg. Co. 49	liance Div.	Jarvis, Charles L., Co	National Acme Co
ing Co. 307 Buffalo Forge Co. 300 Buffalo Forge Co. 300 Buffalo Forge Co. 300 Bullard Company Insert bet. 64-67 Bunell Machine & Tool Co. 331 Bunting Brass & Bronze Co. 94 Butterfield Div., Union Twist Drill Co. 89 C C & C Sales Corp. 270 Campbell Machine Div., American Chain & Cable. 321 Carboloy Department of General Electric Co. 266-267 Carborundum Co. 40-41 Card, S. W., Mfg. Co. 49 Carpenter Steel Co. 406	liance Div.	Jarvis, Charles L., Co	National Acme Co
ing Co. 307 Buffalo Forge Co. 300 Buffalo Forge Co. 300 Buffalo Forge Co. 300 Bullard Company. Insert bet. 64-67 Bunell Machine & Tool Co. 331 Bunting Brass & Bronze Co. 94 Butterfield Div., Union Twist Drill Co. 89 C C & C Sales Corp. 270 Campbell Machine Div., American Chain & Cable. 321 Carboloy Department of General Electric Co. 266-267 Carborundum Co. 40-41 Card, S. W., Mfg. Co. 49 Carpenter Steel Co. 406 Chambersburg Engineering Co. 351	liance Div.	Jarvis, Charles L., Co	National Acme Co
ing Co. 307 Buffalo Forge Co. 300 Buffalo Forge Co. 300 Bullard Company. Insert bet. 64-67 Bunell Machine & Tool Co. 331 Bunting Brass & Bronze Co. 94 Butterfield Div., Union Twist Drill Co. 89 C C & C Sales Corp. 270 Campbell Machine Div., American Chain & Cable. 321 Carboloy Department of General Electric Co. 266-267 Carborundum Co. 40-41 Card, S. W., Mfg. Co. 49 Carpenter Steel Co. 406 Chambersburg Engineering Co. 351 Chandler Tool Co. 427	liance Div.	Jarvis, Charles L., Co	National Acme Co
ing Co. 307 Buffalo Forge Co. 300 Buffalo Forge Co. 300 Buffalo Forge Co. 300 Bullard Company Insert bet. 64-67 Bunell Machine & Tool Co. 331 Bunting Brass & Bronze Co. 94 Butterfield Div., Union Twist Drill Co. 89 C C & C Sales Corp. 270 Campbell Machine Div., American Chain & Cable. 321 Carboloy Department of General Electric Co. 266-267 Carborundum Co. 40-41 Card, S. W., Mfg. Co. 49 Carpenter Steel Co. 406 Chambersburg Engineering Co. 351 Chandler Tool Co. 427 Chicago Pneumatic Tool Co. 367	liance Div.	Jarvis, Charles L., Co	National Acme Co
ing Co. 307 Buffalo Forge Co. 300 Buffalo Forge Co. 300 Buffalo Forge Co. 300 Bullard Company. Insert bet. 64-67 Bunell Machine & Tool Co. 331 Bunting Brass & Bronze Co. 94 Butterfield Div., Union Twist Drill Co. 89 C C & C Sales Corp. 270 Campbell Machine Div., American Chain & Cable. 321 Carboloy Department of General Electric Co. 266-267 Carborundum Co. 40-41 Card, S. W., Mfg. Co. 49 Carpenter Steel Co. 406 Chambersburg Engineering Co. 351 Chandler Tool Co. 427 Chicago Pneumatic Tool Co. 367 Clincinnati Bickford Tool Co. 237	liance Div.	Jarvis, Charles L., Co	National Acme Co
ing Co. 307 Buffalo Forge Co. 300 Buffalo Forge Co. 300 Buffalo Forge Co. 300 Bullard Company. Insert bet. 64-67 Bunell Machine & Tool Co. 331 Bunting Brass & Bronze Co. 94 Butterfield Div., Union Twist Drill Co. 89 C C & C Sales Corp. 270 Campbell Machine Div., American Chain & Cable. 321 Carboloy Department of General Electric Co. 266-267 Carborundum Co. 40-41 Card, S. W., Mfg. Co. 49 Carpenter Steel Co. 406 Chambersburg Engineering Co. 351 Chandler Tool Co. 367 Chicago Pneumatic Tool Co. 367 Cincinnati Bickford Tool Co. 237 Cincinnati Gaff Co. 362	liance Div.	Jarvis, Charles L., Co	National Acme Co
ing Co. 307 Buffalo Forge Co. 300 Buffalo Forge Co. 300 Buffalo Forge Co. 300 Bullard Company Insert bet. 64-67 Bunell Machine & Tool Co. 331 Bunting Brass & Bronze Co. 94 Butterfield Div., Union Twist Drill Co. 89 C C & C Sales Corp. 270 Campbell Machine Div., American Chain & Cable. 321 Carboloy Department of General Electric Co. 266-267 Carborundum Co. 40-41 Card, S. W., Mfg. Co. 49 Carpenter Steel Co. 406 Chambersburg Engineering Co. 351 Chandler Tool Co. 367 Clincinnati Bickford Tool Co. 237 Cincinnati Geaf Co. 362 Cincinnati Cathe & Tool Co.	liance Div.	Jarvis, Charles L., Co	National Acme Co
ing Co. 307 Buffalo Forge Co. 300 Buffalo Forge Co. 300 Buffalo Forge Co. 300 Bullard Company. Insert bet. 64-67 Bunell Machine & Tool Co. 331 Bunting Brass & Bronze Co. 94 Butterfield Div., Union Twist Drill Co. 89 C C & C Sales Corp. 270 Campbell Machine Div., American Chain & Cable. 321 Carboloy Department of General Electric Co. 266-267 Carborundum Co. 40-41 Card, S. W., Mfg. Co. 49 Carpenter Steel Co. 406 Chambersburg Engineering Co. 351 Chandler Tool Co. 367 Chicago Pneumatic Tool Co. 367 Cincinnati Bickford Tool Co. 237 Cincinnati Gaff Co. 362	liance Div.	Jarvis, Charles L., Co	National Acme Co

ALPHABETICAL INDEX OF ADVERTISERS-Continued

0	Ross Operating Valve Co 243	Sun Oil Co 247	W
Oakite Products, Inc 97	Rowbottom Machine Co 424	Sundstrand Machine Tool Co.,	Waldes Kohinoor, Inc 377
Ohio Crankshaft Co 37	Russell, Holbrook & Hender-	Insert bet. 74-89	Walker, O. S., Co., Inc 418
Oliver Instrument Co 286	son, Inc 373		Walls Sales Corp. 425
Onsrud Machine Works, Inc 393	Ruthman Machinery Co 430	T	Waltham Machine Works 425
Osborn Manufacturing Co 399	Ryerson, Joseph T., & Son,	Taft-Peirce Mfg. Co124-125	Warner & Swasey Co30-31
	Inc 148	Tannewitz Works 350	Watson-Stillman Co 297
Ottemiller, William H., Co 433	e	Texas Company 144	Webber Gage Co 316
	21 2 1 11 11 11	Thompson Grinder Co 271	Wheelock, Lovejoy & Co., Inc. 332
	Sales Service Machine Tool	Threadwell Tap & Die Co.,	Wesson Company 274
Pangborn Corporation 436	Co394	Insert bet, 138-141	Wicaco Machine Corp 344
Parker-Kalon Corp 412	Scherr, George, Co., Inc426-429	Tide Water Associated Oil Co. 121	Wiedemann Machine Co 112
Perkins Machine & Gear Co 358	Schrader's, A., Son	Timken Roller Bearing Co.,	Williams, J. H., & Co 288
Philadelphia Gear Wks., Inc. 114	Seneca Falls Machine Co. 262-263	Front Cover	Williamson Gear & Mch. Co 424
Pioneer Engineering & Mfg.	Severance Tool Industries, Inc. 428	Timken Roller Bearing Co.	Wilson, K. R 44
Co., Inc 320	Shafer Bearing Corp 391	(Steel & Tube Div.) 99	Wilson Mechanical Instrument
Pioneer Pump & Mfg. Co., Inc. 320	Sheffield Corp255	Titeflex, Inc	Div., American Chain & Cable 429
Pope Machinery Corp 333	Sheldon Machine Co., Inc 308	Torit Manufacturing Co 326	Winter Brothers Co 22
Potter & Johnston Co 317	Shell Oil Co	Torrington Co	Wood & Spencer Co 419
Pratt & Whitney Div., Niles-	Shore Instrument & Mfg. Co.,	Tuthill Pump Co	Trood & opened Co
Bement-Pond Co. 60-61-318-319	Inc 428	Tutani Tump Co	Y
Procunier Safety Chuck Co 330	Sidney Machine Tool Co 249	II.	V-1 0
Producto Machine Co 142	Simonds Abrasive Co 400	U. S. Tool Company, Inc 12-13	Yoder Company 130
Pull-Gear Co 426	Simonds Saw & Steel Co 315	Union Carbide & Carbon Corp.,	2.
	S K F Industries, Inc278-279	Haynes Stellite Co. Div 419	
R	Skinner Chuck Co 290		Zagar Tool, Inc 314
	Snow Manufacturing Co 282	Union Twist Drill Co., Insert bet. 116-121	Zeh & Hahnemann Co 420
R and L Tools	South Bend Lathe Works 70-116	United States Steel Co 96	
Rehnberg-Jacobson Mfg. Co.,	Springfield Machine Tool Co 307		
Insert bet. 74-89	Stahl Gear & Machine Co 426	Universal Engineering Co 361	IN CLASSIFIED SECTION
Reliance Div., Eaton Manu-	Standard Electrical Tool Co 354	Used Machinery431-432	
facturing Co 349	Standard Gage Co., Inc 74	V	Barrett Machine Works 431
Reliance Electric & Engineer-	Standard Locknut & Lock-		Brody, Leonard, Industries 431
ing CoInsert 90-91	washer, Inc 403	V & O Press Div., Emhart	Eastern Machinery Co 431
Republic Steel Corp 106	Standard Oil Co. (Indiana) 264-265	Mfg. Co 402	Falk Machinery Co 431
Revere Copper & Brass, Inc 257	Standard Pressed Steel Co 68	Van Keuren Co 276	Hyman, Joseph, & Sons 431
Rivett Lathe & Grinder, Inc 299	Standard Tool Co 345	Van Norman Co 8-9	Miles Machinery Co 432
Rockford Clutch Div. of Borg-	Starrett, The L. S., Co 250	Veeder-Root, Inc	Morey Machinery Co., Inc 432
Warner 336	Struthers Wells Corp 294	Verson Allsteel Press Co 421	Neerup Industrial Equipment. 432
Rockford Machine Tool Co.,	Stuart, D. A., Oil Co., Ltd 57	Viking Pump Co	Nord International Corp 431 Southern Tin Compress Corp. 431
Insert bet. 74-89	Sturtevant, P. A., Co 428		







BEARING DOWN ON PRODUCTION

This Clearing press at Aetna Ball Bearing & Roller Co. is equipped with automatic feed and combination die so that every press stroke delivers a completed piece. Production on this basis brings costs right down to bedrock.

Just as important as speed of production is the *precision* with which the press operates. That's a big reason why Aetna chose the Clearing for this spot. Accurate, uniform output at top speed results in a really quality product without getting unreasonable costs.

Clearing presses can improve your production picture, too. Why don't you get in touch with us? It won't cost you anything to find out the facts.

CLEARING MACHINE CORPORATION

6499 WEST 65TH STREET * CHICAGO 38, ILLINOIS

CLEARING PRESSES



THE WAY TO EFFICIENT MASS PRODUCTION